CITY MULTI® WR2-SERIES SYSTEM DESIGN

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1-1. General Cautions

① Follow ordinance of your governmental organization for technical standard related to electrical equipment, wiring regulations, and guidance of each electric power company.

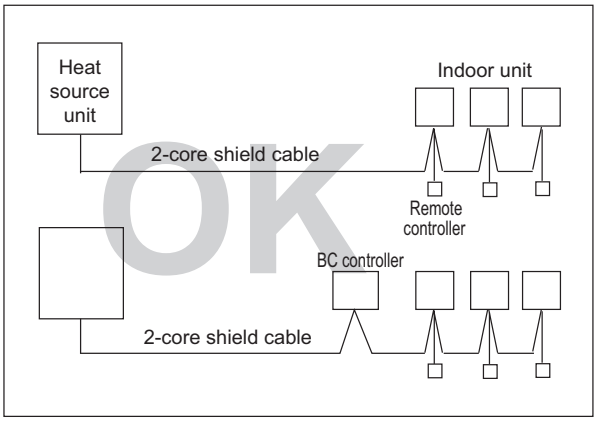
② Wiring for control (hereinafter referred to as transmission cable) shall be (50mm[1-5/8in] or more) apart from power source wiring so that it is not influenced by electric noise from power source wiring. (Do not insert transmission cable and power source wire in the same conduit.)

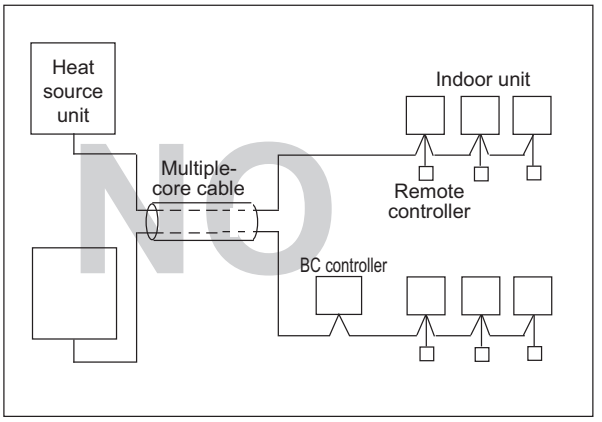
③ Be sure to provide designated grounding work to heat source unit.

④ Give some allowance to wiring for electrical part box of indoor and heat source unit, because the box is sometimes removed at the time of service work.

⑤ Never connect 100V, 208~230V, 460V power source to terminal block of transmission cable. If connected,electrical parts will be burnt out.

⑥ Use 2-core shield cable for transmission cable . If transmission cables of different systems are wired with the same multiplecore cable, the resultant poor transmitting and receiving will cause erroneous operations.





1-2. Power Supply for Indoor Unit and Outdoor Unit

1-2-1. Electrical Characteristics of Indoor Unit

Symbols: MCA : Min.Circuit Amps (=1.25xFLA) FLA : Full Load Amps
IFM :Indoor Fan Motor Output : Fan motor rated output

Model	Indoor Unit				IFM
	Hz	Volts	Voltage range	MCA(A)	FLA(A)
PLFY-P06NLMU-E	60Hz	208 / 230V	188 to 253V	0.43 / 0.47	0.34 / 0.37
PLFY-P08NLMU-E				0.43 / 0.47	0.34 / 0.37
PLFY-P12NLMU-E				0.43 / 0.47	0.34 / 0.37
PLFY-P15NLMU-E				0.48 / 0.53	0.38 / 0.42
PLFY-P18NLMU-E				0.49 / 0.54	0.39 / 0.43
PLFY-P08NCMU-E			198 to 253V	0.29 / 0.29	0.23 / 0.23
PLFY-P12NCMU-E				0.35 / 0.35	0.28 / 0.28
PLFY-P15NCMU-E				0.35 / 0.35	0.28 / 0.28
PLFY-P12NBMU-E				0.64 / 0.64	0.51 / 0.51
PLFY-P15NBMU-E				0.64 / 0.64	0.51 / 0.51
PLFY-P18NBMU-E				0.64 / 0.64	0.51 / 0.51
PLFY-P24NBMU-E				0.64 / 0.64	0.51 / 0.51
PLFY-P30NBMU-E				0.64 / 0.64	0.51 / 0.51
PLFY-P36NBMU-E				1.25 / 1.25	1.00 / 1.00
PMFY-P06NBMU-E	60Hz	208 / 230V	188 to 253V	0.25 / 0.25	0.20 / 0.20
PMFY-P08NBMU-E				0.25 / 0.25	0.20 / 0.20
PMFY-P12NBMU-E				0.26 / 0.26	0.21 / 0.21
PMFY-P15NBMU-E				0.33 / 0.33	0.26 / 0.26
PEFY-P06NMAU-E	60Hz	208 / 230V	198 to 253V	1.05 / 1.05	0.84 / 0.84
PEFY-P08NMAU-E				1.05 / 1.05	0.84 / 0.84
PEFY-P12NMAU-E				1.21 / 1.21	0.97 / 0.97
PEFY-P15NMAU-E				1.45 / 1.45	1.16 / 1.16
PEFY-P18NMAU-E				1.56 / 1.56	1.25 / 1.25
PEFY-P24NMAU-E				2.25 / 2.25	1.80 / 1.80
PEFY-P27NMAU-E				2.49 / 2.49	1.99 / 1.99
PEFY-P30NMAU-E				2.50 / 2.50	2.00 / 2.00
PEFY-P36NMAU-E				3.33 / 3.33	2.66 / 2.66
PEFY-P48NMAU-E				3.41 / 3.41	2.73 / 2.73
PEFY-P54NMAU-E				3.31 / 3.31	2.65 / 2.65
PEFY-P06NMSU-E	60Hz	208 / 230V	188 to 253V	0.47 / 0.50	0.32 / 0.31
PEFY-P08NMSU-E				0.47 / 0.50	0.41 / 0.39
PEFY-P12NMSU-E				0.68 / 0.74	0.46 / 0.43
PEFY-P15NMSU-E				1.20 / 1.33	0.47 / 0.45
PEFY-P18NMSU-E				1.20 / 1.33	0.64 / 0.60
PEFY-P24NMSU-E				1.57 / 1.73	0.88 / 0.83
PEFY-P27NMHU-E				1.72 / 1.89	1.37 / 1.51
PEFY-P30NMHU-E				2.08 / 2.29	1.66 / 1.83
PEFY-P36NMHU-E				4.23 / 4.67	3.38 / 3.73
PEFY-P48NMHU-E				4.23 / 4.67	3.38 / 3.73
PEFY-P54NMHU-E				4.29 / 4.73	3.43 / 3.78
PEFY-P72NMHU-E				5.60 / 6.18	4.48 / 4.94
PEFY-P96NMHU-E				7.12 / 7.85	5.69 / 6.28

1. ELECTRICAL WORK

Symbols: MCA : Min.Circuit Amps (=1.25xFLA) FLA : Full Load Amps
IFM :Indoor Fan Motor Output : Fan motor rated output

Model	Indoor Unit				IFM
	Hz	Volts	Voltage range	MCA(A)	FLA(A)
PCFY-P15NKMU-E	60Hz	208 / 230V	188 to 253V	0.44 / 0.44	0.35 / 0.35
PCFY-P24NKMU-E				0.52 / 0.52	0.41 / 0.41
PCFY-P30NKMU-E				1.22 / 1.22	0.97 / 0.97
PCFY-P36NKMU-E				1.22 / 1.22	0.97 / 0.97
PKFY-P06NBMU-E	60Hz	208 / 230V	198 to 253V	0.19 / 0.19	0.15 / 0.15
PKFY-P08NBMU-E				0.19 / 0.19	0.15 / 0.15
PKFY-P12NHMU-E				0.38 / 0.38	0.30 / 0.30
PKFY-P15NHMU-E				0.38 / 0.38	0.30 / 0.30
PKFY-P18NHMU-E				0.38 / 0.38	0.30 / 0.30
PKFY-P24NKMU-E				0.37 / 0.37	0.29 / 0.29
PKFY-P30NKMU-E				0.54 / 0.54	0.43 / 0.43
PFFY-P06NEMU-E	60Hz	208 / 230V	188 to 253V	0.32 / 0.34	0.25 / 0.27
PFFY-P08NEMU-E				0.32 / 0.34	0.25 / 0.27
PFFY-P12NEMU-E				0.34 / 0.38	0.27 / 0.30
PFFY-P15NEMU-E				0.40 / 0.44	0.32 / 0.35
PFFY-P18NEMU-E				0.48 / 0.53	0.38 / 0.42
PFFY-P24NEMU-E				0.59 / 0.64	0.47 / 0.51
PFFY-P06NRMU-E	60Hz	208 / 230V	188 to 253V	0.32 / 0.34	0.25 / 0.27
PFFY-P08NRMU-E				0.32 / 0.34	0.25 / 0.27
PFFY-P12NRMU-E				0.34 / 0.38	0.27 / 0.30
PFFY-P15NRMU-E				0.40 / 0.44	0.32 / 0.35
PFFY-P18NRMU-E				0.48 / 0.53	0.38 / 0.42
PFFY-P24NRMU-E				0.59 / 0.64	0.47 / 0.51
PVFY-P12E00A	60Hz	208 / 230V	188 to 253V	0.56 / 0.50	0.45 / 0.40
PVFY-P18E00A				1.53 / 1.38	1.22 / 1.10
PVFY-P24E00A				1.39 / 1.25	1.11 / 1.00
PVFY-P30E00A				2.50 / 2.25	2.00 / 1.80
PVFY-P36E00A				2.09 / 1.88	1.67 / 1.50
PVFY-P48E00A				2.23 / 2.00	1.78 / 1.60
PVFY-P54E00A				2.64 / 2.38	2.11 / 1.90
PWFY-P36NMU-E-BU	60Hz	208 / 230V	188 to 253V	25	-
PWFY-P36NMU-E-AU				0.09	-
PWFY-P72NMU-E-AU				0.09	-

1-2-2. Electrical Characteristics of Water-source Unit

Symbols: MCA : Min.Circuit Amps
SC : Starting Current RLA : Rated Load Amps

PQRY-P-T(S)HMU

Model	Unit Combination	Water-source unit						Compressor
		Hz	Volts	Voltage range	RLA(A)	MCA(A)	Max.Fuse(A)	SC(A)
PQRY-P72THMU-A	-	60Hz	208/230V	188 to 253V	12.6/11.4	16/15	25/20	15
PQRY-P96THMU-A	-				18.0/16.2	23/21	40/30	15
PQRY-P120THMU-A	-				23.6/21.4	30/27	50/40	15
PQRY-P144TSHMU-A	PQRY-P72THMU-A				12.6/11.4	16/15	25/20	15
	PQRY-P72THMU-A				12.6/11.4	16/15	25/20	15
PQRY-P168TSHMU-A	PQRY-P72THMU-A				12.6/11.4	16/15	25/20	15
	PQRY-P96THMU-A				18.0/16.2	23/21	40/30	15
PQRY-P192TSHMU-A	PQRY-P96THMU-A				18.0/16.2	23/21	40/30	15
	PQRY-P96THMU-A				18.0/16.2	23/21	40/30	15
PQRY-P216TSHMU-A	PQRY-P96THMU-A				18.0/16.2	23/21	40/30	15
	PQRY-P120THMU-A				23.6/21.4	30/27	50/40	15
PQRY-P240TSHMU-A	PQRY-P120THMU-A				23.6/21.4	30/27	50/40	15
	PQRY-P120THMU-A				23.6/21.4	30/27	50/40	15

Symbols: MCA : Min.Circuit Amps
SC : Starting Current RLA : Rated Load Amps

PQRY-P-Y(S)HMU

Model	Unit Combination	Heat source unit						Compressor
		Hz	Volts	Voltage range	RLA(A)	MCA(A)	Max.Fuse(A)	SC(A)
PQRY-P72YHMU-A	-	60Hz	460V	414 to 506V	5.7	8	15	7
PQRY-P96YHMU-A	-				8.1	11	15	7
PQRY-P120YHMU-A	-				10.7	14	20	7
PQRY-P144YSHMU-A	PQRY-P72YHMU-A				5.7	8	15	7
	PQRY-P72YHMU-A				5.7	8	15	7
PQRY-P168YSHMU-A	PQRY-P72YHMU-A				5.7	8	15	7
	PQRY-P96YHMU-A				8.1	11	15	7
PQRY-P192YSHMU-A	PQRY-P96YHMU-A				8.1	11	15	7
	PQRY-P96YHMU-A				8.1	11	15	7
PQRY-P216YSHMU-A	PQRY-P96YHMU-A				8.1	11	15	7
	PQRY-P120YHMU-A				10.7	14	20	7
PQRY-P240YSHMU-A	PQRY-P120YHMU-A				10.7	14	20	7
	PQRY-P120YHMU-A				10.7	14	20	7

1-2-3. Electrical Characteristics of BC Controller

Symbols: MCA : Min.Circuit Amps (=1.25 x RLA)
RLA : Rated Load Amps

BC-Controller for PQRY-P-TGMU

Model	Hz	Volts	Voltage range	MCA(A)	MOCP	RLA(A)
CMB-P104NU-G	60Hz	208 / 230V	198 to 253V	0.36 / 0.34	15 / 15	0.29 / 0.27
CMB-P105NU-G				0.45 / 0.40	15 / 15	0.36 / 0.32
CMB-P106NU-G				0.53 / 0.48	15 / 15	0.42 / 0.38
CMB-P108NU-G				0.68 / 0.61	15 / 15	0.54 / 0.49
CMB-P1010NU-G				0.84 / 0.75	15 / 15	0.67 / 0.60
CMB-P1013NU-G				1.08 / 0.98	15 / 15	0.86 / 0.78
CMB-P1016NU-G				1.31 / 1.19	15 / 15	1.05 / 0.95
CMB-P108NU-GA				0.68 / 0.61	15 / 15	0.54 / 0.49
CMB-P1010NU-GA				0.84 / 0.75	15 / 15	0.67 / 0.60
CMB-P1013NU-GA				1.08 / 0.98	15 / 15	0.86 / 0.78
CMB-P1016NU-GA				1.31 / 1.19	15 / 15	1.05 / 0.95
CMB-P104NU-GB				0.33 / 0.30	15 / 15	0.26 / 0.24
CMB-P108NU-GB				0.64 / 0.59	15 / 15	0.51 / 0.47

1-3. Power Cable Specifications

Thickness of wire for main power supply, capacities of the switch and system impedance								
	Model	Minimum wire thickness (mm²/AWG)			Breaker for current leakage	Switch (A)		Breaker for wiring (NFB)
		Main cable	Branch	Ground		Capacity	Fuse	
Water-source unit	PQRY-P72THMU-A	3.3/12	-	3.3/12	20A 30mA or 100mA 0.1sec. or less	20	25	20
	PQRY-P96THMU-A	5.3/10	-	5.3/10	30A 30mA or 100mA 0.1sec. or less	30	40	30
	PQRY-P120THMU-A	8.4/8	-	8.4/8	40A 100mA 0.1sec. or less	40	50	40
Indoor unit		0.41/22	0.41/22	0.41/22	15A 30mA or 100mA 0.1sec. or less	15	15	15

	Model	Minimum wire thickness (mm²/AWG)			Breaker for current leakage	Switch (A)		Breaker for wiring (NFB)
		Main cable	Branch	Ground		Capacity	Fuse	
Water-source unit	PQRY-P72YHMU-A	2.1/14	-	2.1/14	15A 30mA or 100mA 0.1sec. or less	15	15	15
	PQRY-P96YHMU-A	2.1/14	-	2.1/14	15A 30mA or 100mA 0.1sec. or less	15	15	15
	PQRY-P120YHMU-A	3.3/12	-	3.3/12	20A 30mA or 100mA 0.1sec. or less	20	20	20
Indoor unit		0.41/22	0.41/22	0.41/22	15A 30mA or 100mA 0.1sec. or less	15	15	15

1. Use dedicated power supplies for the heat source unit and indoor unit. Ensure OC and OS are wired individually.
2. Bear in mind ambient conditions (ambient temperature,direct sunlight, rain water,etc.) when proceeding with the wiring and connections.
3. The wire size is the minimum value for metal conduit wiring. If the voltage drops, use a wire that is one rank thicker in diameter. Make sure the power-supply voltage does not drop more than 10%.
4. Specific wiring requirements should adhere to the wiring regulations of the region.
5. Power supply cords of parts of appliances for heat source use shall not be lighter than polychloroprene sheathed flexible cord (design 245 IEC57). For example, use wiring such as YZW.
6. A switch with at least 3 mm [1/8 in.] contact separation in each pole shall be provided by the Air Conditioner installer.

CAUTION

• Be sure to use specified wires for connections and ensure no external force is imparted to terminal connections. If connections are not fixed firmly, heating or fire may result.
• Be sure to use the appropriate type of overcurrent protection switch. Note that generated overcurrent may include some amount of direct current.

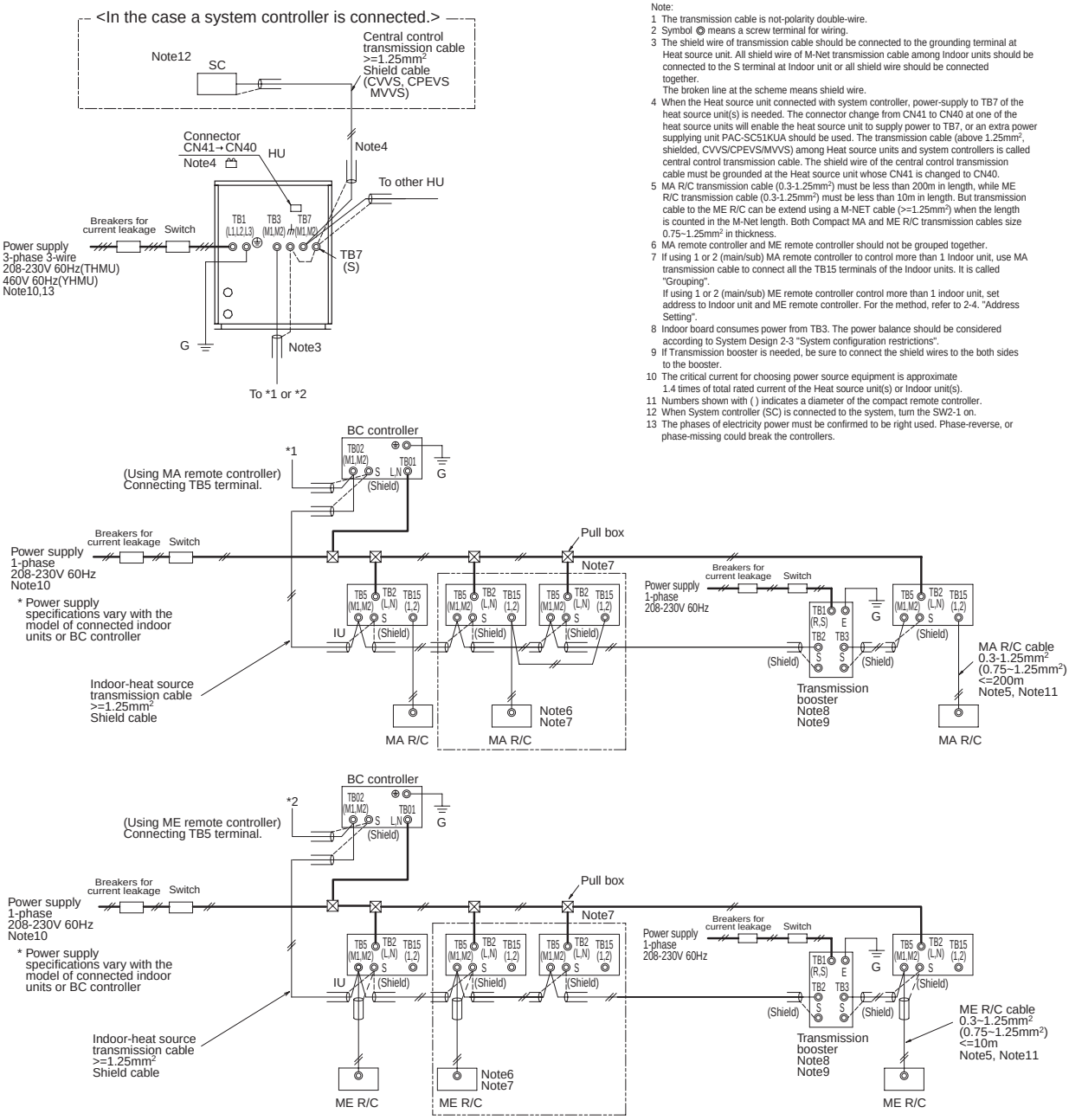
WARNING

• Some installation sites may require attachment of an earth leakage breaker for the inverter. If no earth leakage breaker is installed, there is a danger of electric shock.
• Do not use anything other than a breaker and fuse with the correct capacity. Using a fuse or wire of too large capacity may cause malfunction or fire.

1-4. Power Supply Examples

The local standards and/or regulations is applicable at a higher priority.

1-4-1. PQRY-P72, 96, 120THMU/YHMU



Note:
1 The transmission cable is not-polarity double-wire.
2 Symbol ⊛ means a screw terminal for wiring.
3 The shield wire of transmission cable should be connected to the grounding terminal at Heat source unit. All shield wire of M-Net transmission cable among Indoor units should be connected to the S terminal at Indoor unit or all shield wire should be connected together.
The broken line at the scheme means shield wire.
4 When the Heat source unit connected with system controller, power-supply to TB7 of the heat source unit(s) is needed. The connector change from CN41 to CN40 at one of the heat source units will enable the heat source unit to supply power to TB7, or an extra power supplying unit PAC-SC51KUA should be used. The transmission cable (above 1.25mm², shielded, CVVS/CPEVS/MVVS) among Heat source units and system controllers is called central control transmission cable. The shield wire of the central control transmission cable must be grounded at the Heat source unit whose CN41 is changed to CN40.
5 MA R/C transmission cable (0.3-1.25mm²) must be less than 200m in length, while ME R/C transmission cable (0.3-1.25mm²) must be less than 10m in length. But transmission cable to the ME R/C can be extend using a M-NET cable (>=1.25mm²) when the length is counted in the M-Net length. Both Compact MA and ME R/C transmission cables size 0.75~1.25mm² in thickness.
6 MA remote controller and ME remote controller should not be grouped together.
7 If using 1 or 2 (main/sub) MA remote controller to control more than 1 Indoor unit, use MA transmission cable to connect all the TB15 terminals of the Indoor units. It is called "Grouping".
If using 1 or 2 (main/sub) ME remote controller control more than 1 indoor unit, set address to Indoor unit and ME remote controller. For the method, refer to 2-4. "Address Setting".
8 Indoor board consumes power from TB3. The power balance should be considered according to System Design 2-3 "System configuration restrictions".
9 If Transmission booster is needed, be sure to connect the shield wires to the both sides to the booster.
10 The critical current for choosing power source equipment is approximate 1.4 times of total rated current of the Heat source unit(s) or Indoor unit(s).
11 Numbers shown with ( ) indicates a diameter of the compact remote controller.
12 When System controller (SC) is connected to the system, turn the SW2-1 on.
13 The phases of electricity power must be confirmed to be right used. Phase-reverse, or phase-missing could break the controllers.

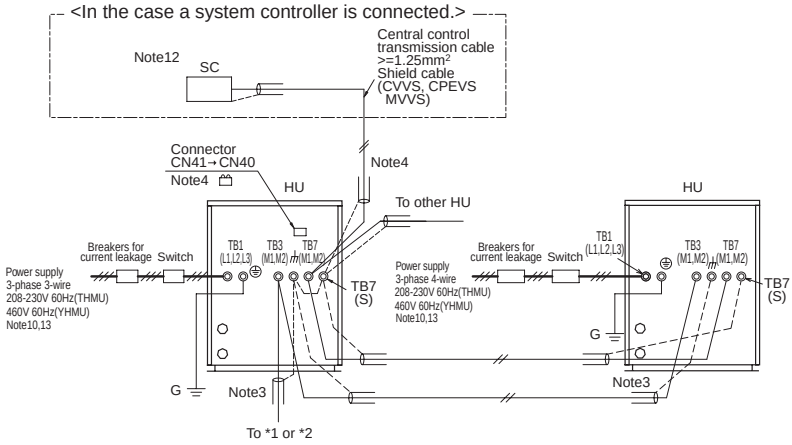
Symbol		Model	Breakers for current leakage *1, *2	Switch BKC <A>	Switch OCP*3 <A>	Switch (NFB) <A>	Minimum Wire thickness Power wire <mm²/AWG>	Minimum Wire thickness G wire <mm²/AWG>
BKC	Breaker capacity	PQRY-P72THMU	20 A 30 mA or 100 mA 0.1 sec. or less	20	20	20	3.3/12	3.3/12
OCP	Over-current protector	PQRY-P96THMU	30 A 30 mA or 100 mA 0.1 sec. or less	30	30	30	5.3/10	5.3/10
NFB	Non-fuse breaker	PQRY-P120THMU	40 A 100 mA 0.1 sec. or less	40	40	40	8.4/8	8.4/8
HU	Heat source unit	PQRY-P72YHMU	15 A 30 mA or 100 mA 0.1 sec. or less	15	15	15	2.1/14	2.1/14
IU	Indoor unit	PQRY-P96YHMU	15 A 30 mA or 100 mA 0.1 sec. or less	15	15	15	2.1/14	2.1/14
SC	System controller	PQRY-P120YHMU	20 A 30 mA or 100 mA 0.1 sec. or less	20	20	20	3.3/12	3.3/12
MA R/C	MA remote controller							
ME R/C	ME remote controller							

*1 The breakers for current leakage should support Inverter circuit. (e.g. Mitsubishi Electric's NV-C series or equivalent).
*2 Breakers for current leakage should combine using of switch.
*3 It shows data for B-type fuse of the breaker for current leakage.

1. ELECTRICAL WORK

The local standards and/or regulations is applicable at a higher priority.

1-4-2. PQRY-P144, 168, 192, 216, 240TSHMU/YSHMU



Note:
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6 MA remote controller and ME remote controller should not be grouped together.
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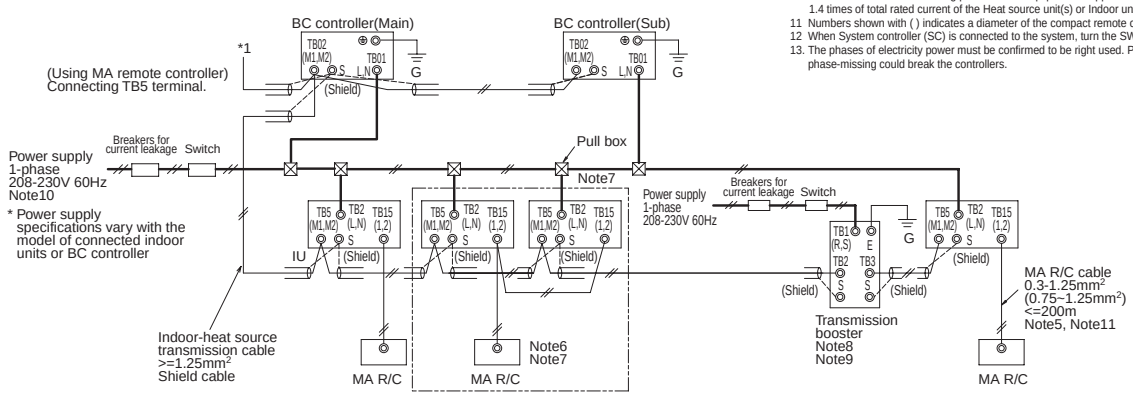
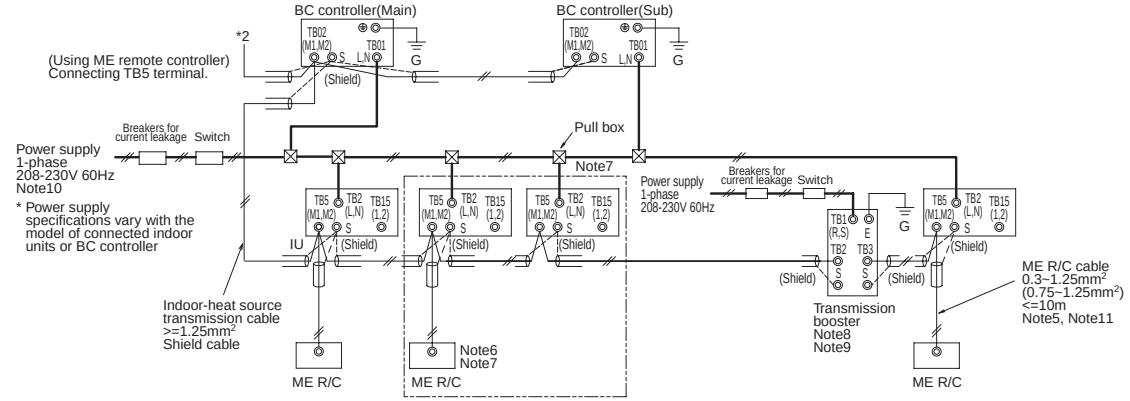
13. The phases of electricity power must be confirmed to be right used. Phase-reverse, or phase-missing could break the controllers.





Symbol		Model	Breakers for current leakage *1, *2	Switch BKC <A>	Switch OCP*3 <A>	Switch (NFB) <A>	Minimum Wire thickness Power wire <mm²/AWG>	Minimum Wire thickness G wire <mm²/AWG>
BKC	Breaker capacity	PQRY-P72THMU	20 A 30 mA or 100 mA 0.1 sec. or less	20	20	20	3.3/12	3.3/12
OCP	Over-current protector	PQRY-P96THMU	30 A 30 mA or 100 mA 0.1 sec. or less	30	30	30	5.3/10	5.3/10
NFB	Non-fuse breaker	PQRY-P120THMU	40 A 100 mA 0.1 sec. or less	40	40	40	8.4/8	8.4/8
HU	Heat source unit	PQRY-P72YHMU	15 A 30 mA or 100 mA 0.1 sec. or less	15	15	15	2.1/14	2.1/14
IU	Indoor unit	PQRY-P96YHMU	15 A 30 mA or 100 mA 0.1 sec. or less	15	15	15	2.1/14	2.1/14
SC	System controller	PQRY-P120YHMU	20 A 30 mA or 100 mA 0.1 sec. or less	20	20	20	3.3/12	3.3/12
MA R/C	MA remote controller							
ME R/C	ME remote controller							

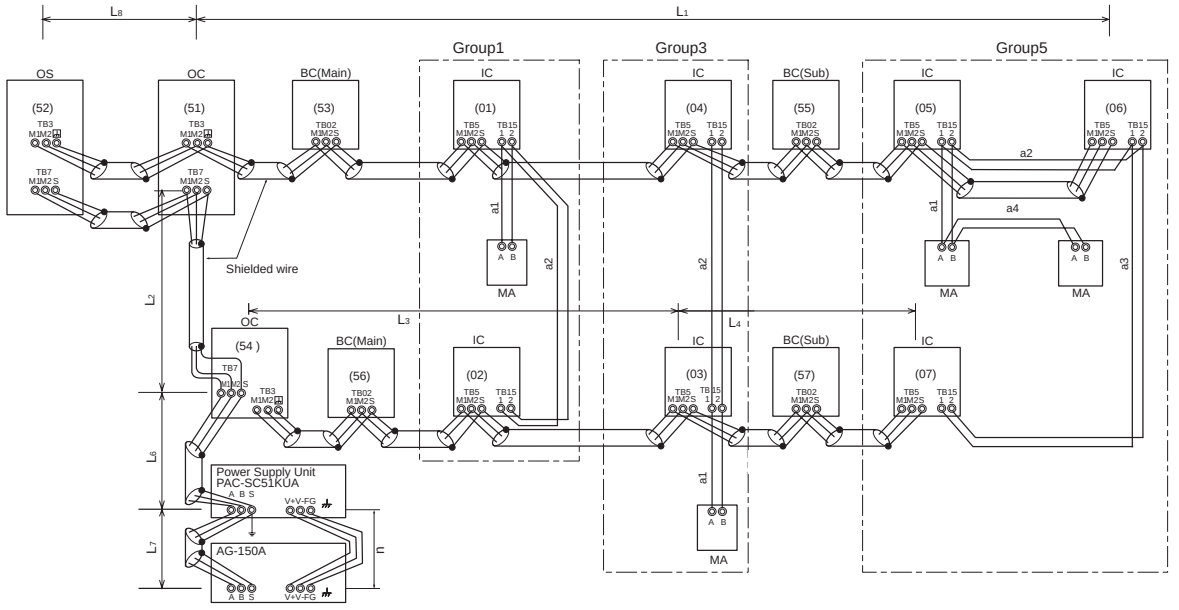
*1 The breakers for current leakage should support Inverter circuit. (e.g. Mitsubishi Electric's NV-C series or equivalent).
*2 Breakers for current leakage should combine using of switch.
*3 It shows data for B-type fuse of the breaker for current leakage.

2-1. Transmission Cable Length Limitation

2-1-1. Using MA Remote controller

Long transmission cable causes voltage down, therefore, the length limitation should be obeyed to secure proper transmission.

Max. length via Heat source (M-NET cable)	L1+L2+L3+L4, L1+L2+L6+L7, L3+L4+L6+L7	<=500m[1640ft.]	1.25mm^2 [AWG16] or thicker
Max. length to Heat source (M-NET cable)	L1+L8, L3+L4, L6, L2+L6+L8, L7	<=200m[656ft.]	1.25mm^2 [AWG16] or thicker
Max. length from MA to Indoor	a1+a2, a1+a2+a3+a4	<=200m[656ft.]	0.3-1.25 mm^2 [AWG22-16]
24VDC to AG-150A	n	<=50m[164ft.]	0.75-2.0 mm^2 [AWG18-14]



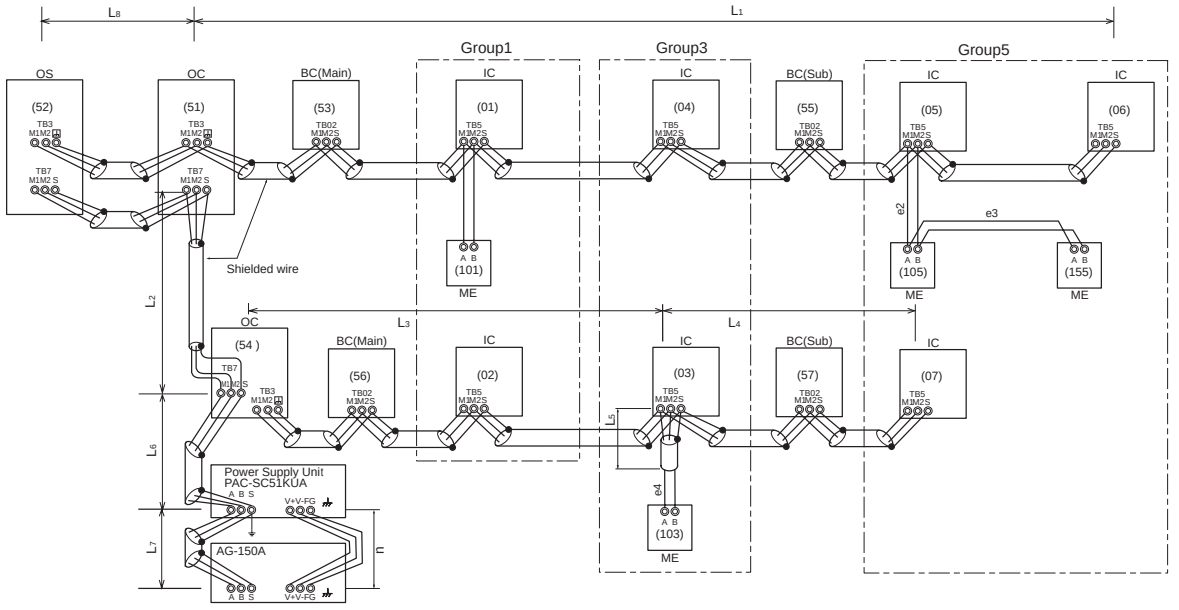
OC, OS: Heat source unit controller; IC: Indoor unit controller; ME: ME remote controller

2-1-2. Using ME Remote controller

Long transmission cable causes voltage down, therefore, the length limitation should be obeyed to secure proper transmission.

Max. length via Heat source (M-NET cable)	L1+L2+L3+L4, L1+L2+L6+L7,L1+L2+L3+L5, L3+L4+L6+L7	<=500m[1640ft.]	1.25mm^2 [AWG16] or thicker
Max. length to Heat source (M-NET cable)	L1+L8, L3+L4, L6, L2+L6+L8, L7, L3+L5	<=200m[656ft.]	1.25mm^2 [AWG16] or thicker
Max. length from ME to Indoor	e1, e2+e3, e4	<=10m[32ft.]*1	0.3-1.25 mm^2 [AWG22-16] *1
24VDC to AG-150A	n	<=50m[164ft.]	0.75-2.0 mm^2 [AWG18-14]

*1. If the length from ME to Indoor exceed 10m, use 1.25 mm^2 [AWG16] shielded cable, but the total length should be counted into Max. length via Heat source.



OC, OS: Heat source unit controller; IC: Indoor unit controller; ME: ME remote controller

2-2. Transmission Cable Specifications

	Transmission cables (L_i)	ME Remote controller cables	MA Remote controller cables
Type of cable	Shielding wire (2-core) CVVS, CPEVS or MVVS	Sheathed 2-core cable (unshielded) CVV	
Cable size	More than 1.25mm^2 [AWG16]	0.3～1.25mm^2 [AWG22～16] (0.75～1.25mm^2 [AWG18~16])*1	0.3～1.25mm^2 [AWG22～16] (0.75～1.25mm^2 [AWG18~16])*1
Remarks	—	When 10m [32ft] is exceeded, use cables with the same specification as transmission cables.	Max length : 200m [656ft]

*1 Connected with simple remote controller.

CVVS, MVVS : PVC insulated PVC jacketed shielded control cable
CPEVS : PE insulated PVC jacketed shielded communication cable
CVV : PV insulated PVC sheathed control cable

2-3. System Configuration Restrictions

2-3-1. Common restrictions for the CITY MULTI system

For each Heat source unit, the maximum connectable quantity of Indoor unit is specified at its Specifications table.

A) 1 Group of Indoor units can have 1-16 Indoor units;

B) Maximum 2 remote controllers for 1 Group;

C) 1 LOSSNAY unit can interlock maximum 16 Indoor units; 1 Indoor unit can interlock only 1 LOSSNAY unit.

D) Maximum 3 System controllers are connectable when connecting to TB3 of the Heat source unit.

E) Maximum 3 System controllers are connectable when connecting to TB7 of the Heat source unit, if the transmission power is supplied by the Heat source unit.

F) 4 System controllers or more are connectable when connecting to TB7 of the Heat source unit, if the transmission power is supplied by the power supply unit PAC-SC51KUA. Details refer to 2-3-3-C.

*System controller connected as described in D) and E) would have a risk that the failure of connected Heat source unit would stop power supply to the System controller.

2-3-2. Ensuring proper communication power for M-NET

In order to ensure proper communication among Heat source unit, Indoor unit, LOSSNAY and Controllers, the transmission power situation for the M-NET should be observed. In some cases, Transmission booster should be used. Taking the power consumption index of Indoor unit sized P06-P54 as 1, the equivalent power consumption index and supply capability index of others are listed at Table 2-3-1 and Table 2-3-2.

Table 2-3-1 The equivalent power consumption by index Indoor units, LOSSNAY, controllers

Indoor,OA unit	Indoor unit	BC controller	MA RC.LOSSNAY	ME Remote Contr.	Timers, System Contr.				MN Converter	
Sized P06-P54	Sized P72,P96	CMB	PAR-21MAA PAC-YT51CRB PAR-FA32MA LGH-RX-E PZ-41SLB	PAR-F27MEA PZ-52SF	PAC-SF44SRA PAC-YT34ST AG-150A	GB-50A	TC-24	PAC-YT40ANRA GB-24	CMS-MNF-B	CMS-MNG-E
1	7	2	0	1/4	1/2	3	4	1	1/2	2

*RC : Remote Controller

Table 2-3-2 The equivalent power supply capability index of Trans.Booster, Power supply unit, Connector TB3, TB7 of Heat source unit.

Transmission Booster	Power supply unit	Centralized Controller	Expansion controller	Heat source unit	Heat source unit
PAC-SF46EPA	PAC-SC51KUA	GB-50ADA	PAC-YG50ECA	Connector TB3 and TB7 total *	Connector TB7 only
25	5	6	6	32	6

*If PAC-SC51KUA is used to supply power at TB7 side, no power supply need from Heat source unit at TB7, Connector TB3 itself will therefore have 32.

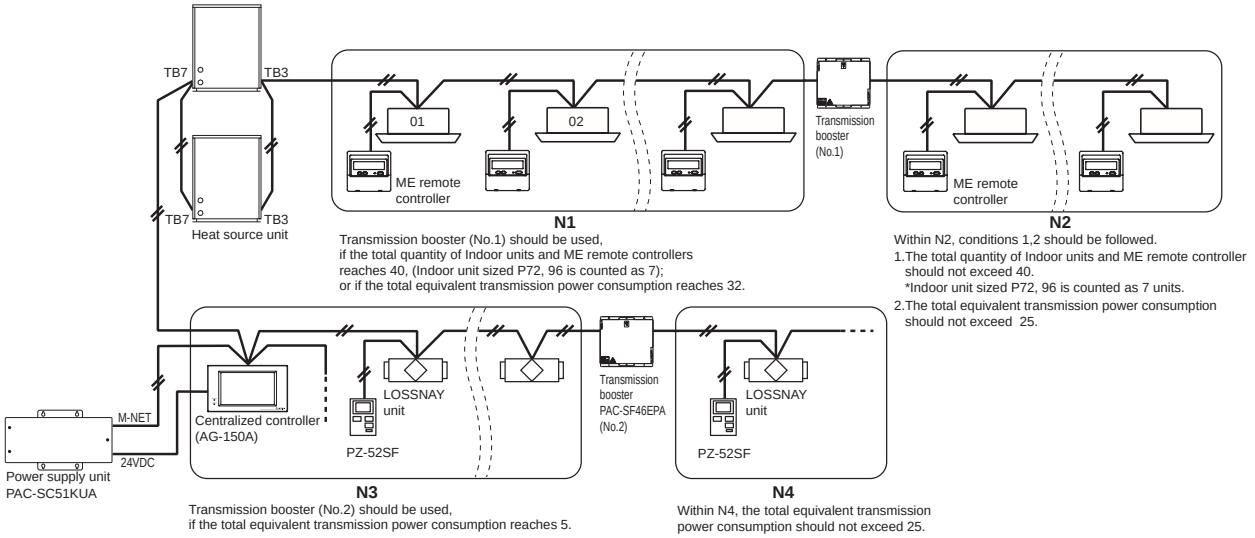
With the equivalent power consumption values in Table 2-3-1 and Table 2-3-2, PAC-SF46EPA can be designed into the air-conditioner system to ensure proper system communication according to 2-3-2-A, B, C.

2-3-2-A) Firstly, count from TB3 at TB3 side the total quantity of Indoor units and ME remote controller, Timers and System controllers.If the total quantity reaches 40, a PAC-SF46EPA should be set.In this case, Indoor unit sized P72, 96 is counted as 7 Indoor units, but MA remote controller(s), LOSSNAY is NOT counted.

2-3-2-B) Secondly, count from TB7 side to TB3 side the total transmission power consumption index. If the total power consumption reaches 32, a PAC-SF46EPA should be set.Yet, if a PAC-SC51KUA is used to supply power at TB7 side, count from index TB3 side only.

2-3-2-C) Thirdly, count from TB7 at TB7 side the total transmission power consumption index, If the total power consumption reaches 6, a PAC-SF46EPA should be set.

■ System example


TB7
TB3
TB7
TB3
Heat source unit
01
02
ME remote controller
N1
Transmission booster (No.1) should be used, if the total quantity of Indoor units and ME remote controllers reaches 40, (Indoor unit sized P72, 96 is counted as 7); or if the total equivalent transmission power consumption reaches 32.
Transmission booster (No.1)
ME remote controller
N2
Within N2, conditions 1,2 should be followed.
1.The total quantity of Indoor units and ME remote controller should not exceed 40.
*Indoor unit sized P72, 96 is counted as 7 units.
2.The total equivalent transmission power consumption should not exceed 25.
M-NET
24VDC
Power supply unit PAC-SC51KUA
Centralized controller (AG-150A)
LOSSNAY unit
PZ-52SF
Transmission booster PAC-SF46EPA (No.2)
LOSSNAY unit
PZ-52SF
N3
Transmission booster (No.2) should be used, if the total equivalent transmission power consumption reaches 5.
N4
Within N4, the total equivalent transmission power consumption should not exceed 25.

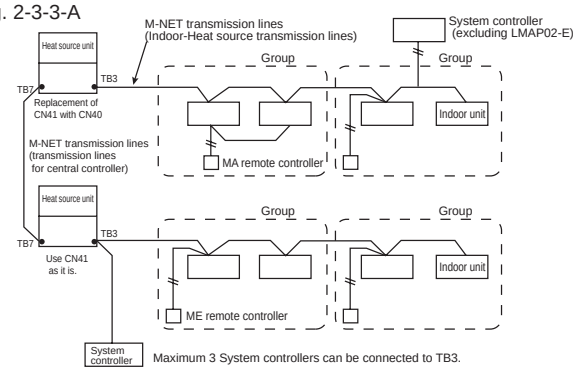
2-3-3. Ensuring proper power supply to System controller

The power to System controller (excluding LMAP03-U) is supplied via M-NET transmission line. M-NET transmission line at TB7 side is called Central control transmission line while one at TB3 side is called Indoor-Heat source transmission line. There are 3 ways to supply power to the System controller .
A) Connecting to TB3 of the Heat source unit and receiving power from the Heat source unit.
B) Connecting to TB7 of the Heat source unit and receiving power from the Heat source unit.
C) Connecting to TB7 of the Heat source unit but receiving power from power supply unit PAC-SC51KUA.

2-3-3-A. When connecting to TB3 of the Heat source unit and receiving power from the Heat source unit.

Maximum 3 System controllers can be connected to TB3.
If there is more than 1 Heat source unit, it is necessary to replace power supply switch connector CN41 with CN40 on one Heat source unit.

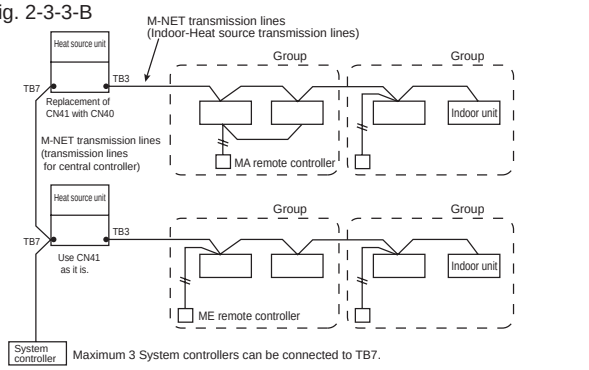
Fig. 2-3-3-A



2-3-3-B. When connecting to TB7 of the Heat source unit and receiving power from the Heat source unit.

Maximum 3 System controllers can be connected to TB7 and receiving power from the Heat source unit.
It is necessary to replace power supply switch connector CN41 with CN40 on one Heat source unit.

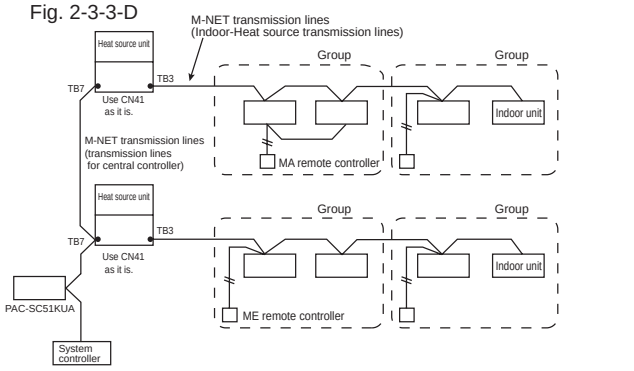
Fig. 2-3-3-B



2-3-3-C. When connecting to TB7 of the Heat source unit but receiving power from PAC-SC51KUA.

When using PAC-SC51KUA to supply transmission power, the power supply connector CN41 on the Heat source units should be kept as it is. It is also a factory setting.
1 PAC-SC51KUA supports maximum 1 AG-150A unit due to the limited power DC 24V at its TB3.
However, 1 PAC-SC51KUA supplies transmission power at its TB2 equal to 5 Indoor units, which is referable at Table 2-3-2.
If PZ-52SF, Timers, System controller, ON/OFF controller connected to TB7 consume transmission power more than 5 (Indoor units), Transmission booster PAC-SF46EPA is needed. PAC-SF46EPA supplies transmission power equal to 25 Indoor units.

Fig. 2-3-3-D



⚠ CAUTION

AG-150A/GB-50A/GB-50ADA/GB-24A/TC-24A is recommended to connect to TB7 because these controllers perform back-up to a number of data.
In an air conditioner system has more than 1 Heat source units, AG-150A/GB-50A/GB-50ADA/GB-24A/TC-24A receiving transmission power at TB3 or TB7 on one of the Heat source units would have a risk that the connected Heat source unit failure would stop power supply to AG-150A/GB-50A/GB-50ADA/GB-24A/TC-24A, and disrupt the whole system. When applying apportioned electric power function, AG-150A/GB-50A/GB-24A/TC-24A is necessary to connected to TB7 and has its own power supply unit PAC-SC51KUA.* *Power supply unit PAC-SC51KUA is for AG-150A.

2-3-4. Power supply to LM adapter LMAP03U

1-phase 208-230V AC power supply is needed.
The power supply unit is not necessary when connecting only the LMAP03U. Yet, make sure to change the power supply changeover connector CN41 to CN40 on the LM adapter.

2-3-5. Power supply to expansion controller

1-phase 100-240VAC power supply is needed.
The power supply unit PAC-SC51KUA is not necessary.
The expansion controller supplies power through TB3, which equals 6 indoor units. (refer to Table 2-3-2)

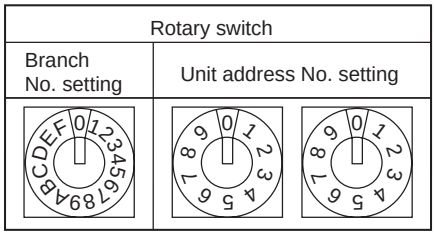
2-3-6. Power supply to BM ADAPTER

1-phase 100-240VAC power supply is needed.
The power supply unit PAC-SC51KUA is not necessary when only BM ADAPTER is connected.
Yet, make sure to move the power jumper from CN41 to CN40 on the BM ADAPTER.

2-4. Address Setting

2-4-1. Switch operation

In order to constitute CITY MULTI in a complete system, switch operation for setting the unit address No. and connection No. is required.



① Address No. of heat source unit, indoor unit and remote controller.
The address No. is set at the address setting board.
In the case of WR2 system, it is necessary to set the same No. at the branch No. switch of indoor unit as that of the BC controller connected. (When connecting two or more branches, use the lowest branch No.)

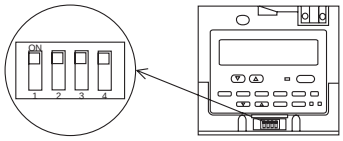
② Caution for switch operations

- Be sure to shut off power source before switch setting. If operated with power source on, switch can not operate properly.
- No units with identical unit address shall exist in one whole air conditioner system. If set erroneously, the system can not operate.

③ MA remote controller

- When connecting only one remote controller to one group, it is always the main remote controller.
  When connecting two remote controllers to one group, set one remote controller as the main remote controller and the other as the sub remote controller.
- The factory setting is "Main".

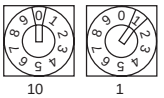
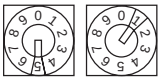
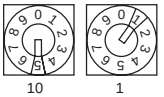
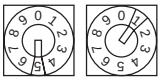
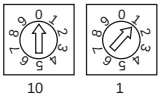
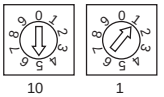
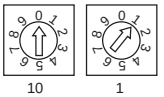
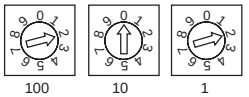
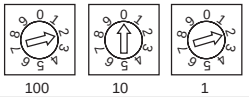
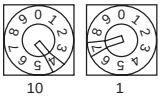
Setting the dip switches



The dip switches are at the bottom of the remote controller.
Remote controller Main/Sub and other function settings are performed using these switches.
Ordinarily, only change the Main/Sub setting of SW1. (The factory settings are all "ON".)

SW No	SW contents Main	ON	OFF	Comment
1	Remote controller Main/Sub setting	Main	Sub	Set one of the two remote controllers at one group to "Main".
2	When remote controller power turned on	Normally on	Timer mode on	When you want to return to the timer mode when the power is restored after a power failure when a Program timer is connected, select "Timer mode".
3	Cooling/heating display in AUTO mode	Yes	No	When you do not want to display "Cooling" and "Heating" in the Auto mode, set to "No".
4	Intake temperature display	Yes	No	When you do not want to display the intake temperature, set to "No".

2-4-2. Rule of setting address

Unit		Address setting	Example	Note
Indoor unit, Lossnay, PAC-YG63MCA (AI Controller), PAC-YG66DCA (DIDO Controller)		01 ~ 50	 10 1	Use the most recent address within the same group of indoor units. Make the indoor units address connected to the BC controller (Sub) larger than the indoor units address connected to the BC controller (Main). If applicable, set the sub BC controllers in an PQRY system in the following order: (1) Indoor unit to be connected to the BC controller (Main) (2) Indoor unit to be connected to the BC controller (No.1 Sub) (3) Indoor unit to be connected to the BC controller (No.2 Sub) Set the address so that (1)<(2)<(3)
Heat source unit		51 ~ 99, 100 (Note1)	 10 1	The smallest address of indoor unit in same refrigerant system + 50 Assign sequential address numbers to the heat source units in one refrigerant circuit system. OC and OS are automatically detected. (Note 2) * Please reset one of them to an address between 51 and 99 when two addresses overlap. * The address automatically becomes "100" if it is set as "01~ 50"
BC controller (Main)		52 ~ 99, 100	 10 1	The address of heat source unit + 1 * Please reset one of them to an address between 51 and 99 when two addresses overlap. * The address automatically becomes "100" if it is set as "01~ 50"
BC controller (Sub)		52 ~ 99, 100	 10 1	Lowest address within the indoor units connected to the BC controller (Sub) plus 50.
Local remote controller	ME, LOSSNAY Remote controller (Main)	101 ~ 150	1 Fixed  10 1	The smallest address of indoor unit in the group + 100 * The place of "100" is fixed to "1"
	ME, LOSSNAY Remote controller (Sub)	151 ~ 199, 200	1 Fixed  10 1	The address of main remote controller + 50 * The address automatically becomes "200" if it is set as "00"
System controller	Group remote controller	201 ~ 250	2 Fixed  10 1	The smallest group No. to be managed + 200
	System remote controller	000, 201 ~ 250	 100 10 1	
	ON/OFF remote controller	000, 201 ~ 250	 100 10 1	
	GB-50ADA, AG-150A, GB-50A, GB-24A/TC-24A	000, 201 ~ 250	0 0 0 100 10 1	
	PAC-YG50ECA	000, 201 ~ 250	0 0 0 100 10 1	* Settings are made on the initial screen of AG-150A.
	BAC-HD150	000, 201 ~ 250	0 0 0 100 10 1	* Settings are made with setting tool of BM ADAPTER.
	LMAP03U	201 ~ 250	2 Fixed  10 1	

Note1: To set the address to "100", set it to "50"
Note2: Heat source units OC and OS in one refrigerant circuit system are automatically detected.
OC and OS are ranked in descending order of capacity. If units are the same capacity, they are ranked in ascending order of their address.

2-4-3. System examples

Factory setting

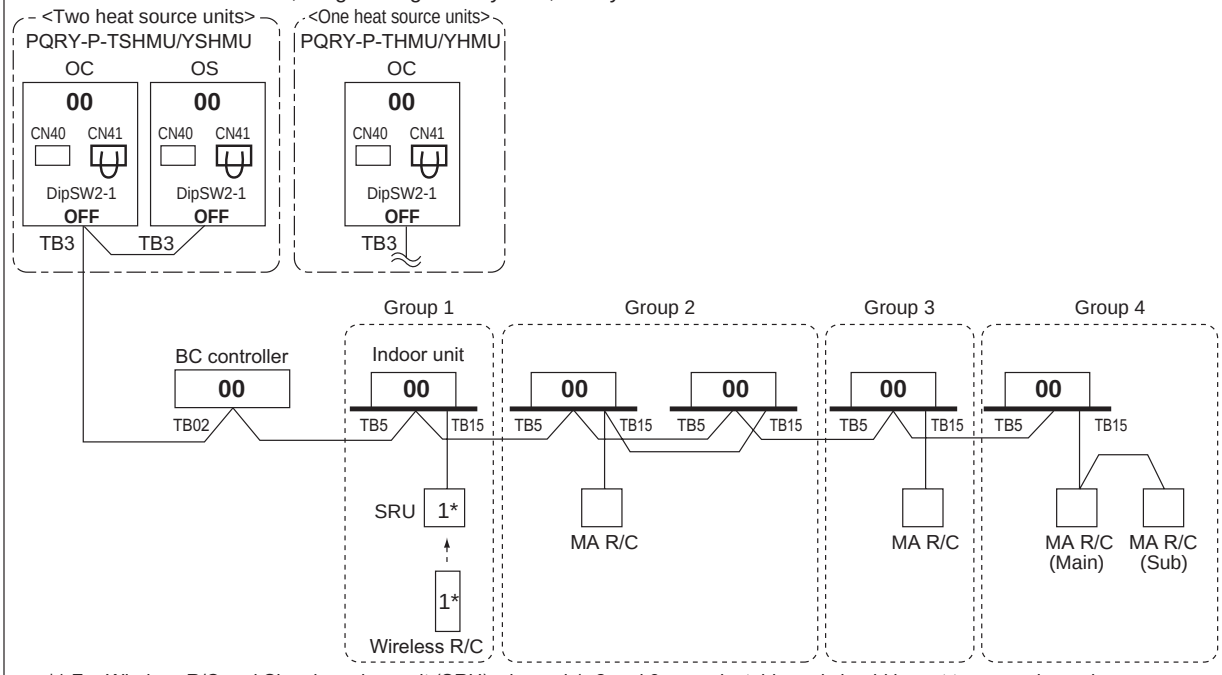
Original switch setting of the heat sources, indoors, controllers and LMAP at shipment is as follows.

- Heat source unit : Address: 00, CN41: U (Jumper), DipSW2-1: OFF
- Indoor unit : Address: 00
- BC controller : Address: 00
- ME remote controller : Address: 101
- LMAP : Address: 247, CN41: U (Jumper), DipSW1-2: OFF

Setting at the site

- DipSW2-1(Heat source) : When the System Controller is used, all the Dip SW2-1 at the heat source units should be set to "ON". * Dip SW2-1 remains OFF when only LMAP03U is used.
- DipSW1-2(LMAP) : When the LMAP is used together with System Controller, DipSW1-2 at the LMAP should be set to "ON".
- CN40/CN41 : Change jumper from CN41 to CN 40 at heat source control board will activate central transmission power supply to TB7;
  (Change jumper at only one heat source unit when activating the transmission power supply without using a power supply unit.)
  Change jumper from CN41 to CN 40 at LMAP will activate transmission power supply to LMAP itself;
  Power supply unit is recommended to use for a system having more than 1 heat source unit, because the central transmission power supply from TB7 of one of heat source units is risking that the heat source unit failure may let down the whole central control system.

2-4-3-1. MA remote controller, Single-refrigerant-system, No System Controller

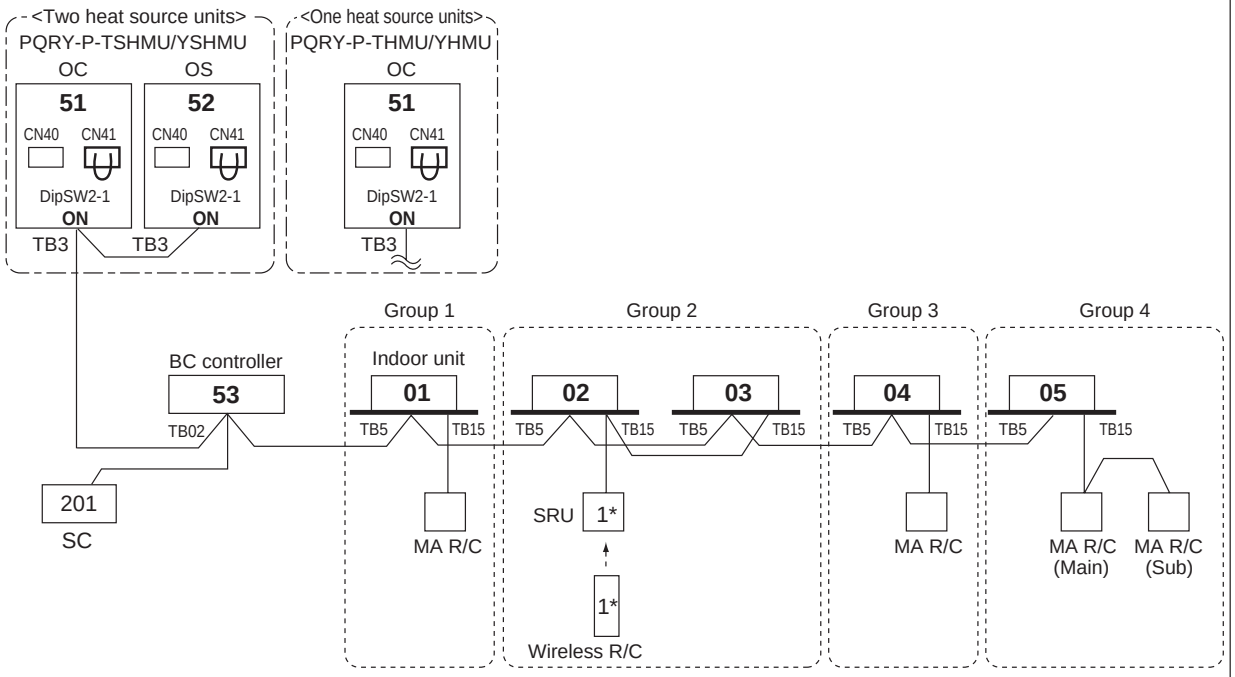


*1 For Wireless R/C and Signal receiver unit (SRU), channel 1, 2 and 3 are selectable and should be set to same channel.

NOTE:

1. Heat source units OC and OS in one refrigerant circuit system are automatically detected.
   OC and OS are ranked in descending order of capacity. If units are the same capacity, they are ranked in ascending order of their address.
2. No address setting is needed.
3. For a system having more than 32 indoor unit (P06-P54), confirm the need of Booster at **2-3 "System configuration restrictions".**
4. Indoor units should be set with a branch number.
5. Address setting is required if a sub BC controller is connected.

2-4-3-2. MA remote controller, Single-refrigerant-system, System Controller

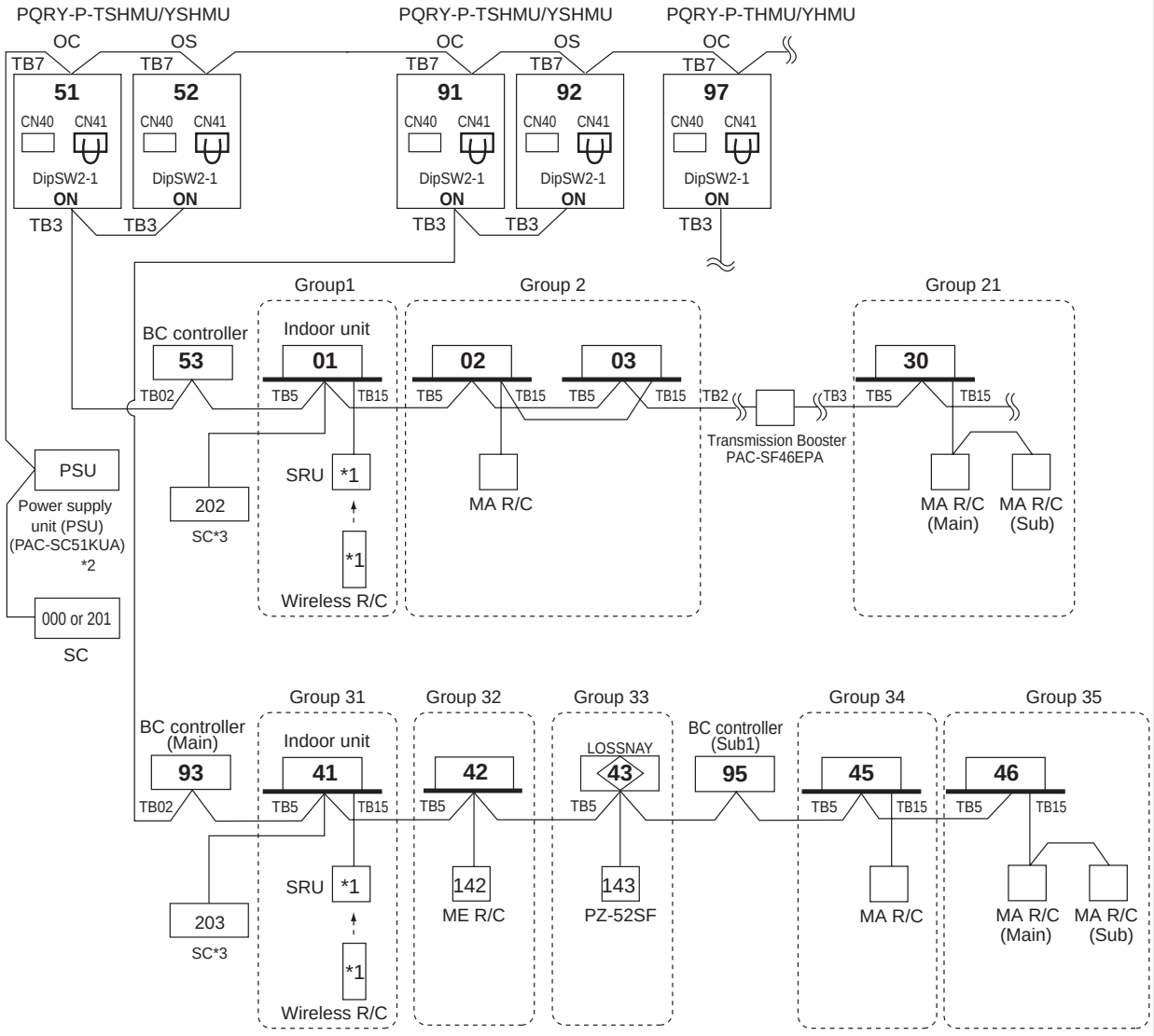


*1 For Wireless R/C and Signal receiver unit (SRU), channel 1, 2 and 3 are selectable and should be set to same channel.

*SC can be connected to TB3 side or TB7 side;
Should SC connected to TB7 side, change Jumper from CN41 to CN40 at the Heat source unit module so as to supply power to the SC.

NOTE:
1. Heat source units OC and OS in one refrigerant circuit system are automatically detected.
   OC and OS are ranked in descending order of capacity. If units are the same capacity, they are ranked in ascending order of their address.
2. Address should be set to Indoor units and central controller.
3. For a system having more than 32 indoor unit (P06-P54), confirm the need of Booster at **2-3 "System configuration restrictions".**
4. Indoor units should be set with a branch number.

2-4-3-3. MA remote controller, Multi-refrigerant-system, System Controller at TB7/TB3 side, Booster for long M-NET wiring



*1 For Wireless R/C and Signal receiver unit (SRU), channel 1, 2 and 3 are selectable and should be set to same channel.

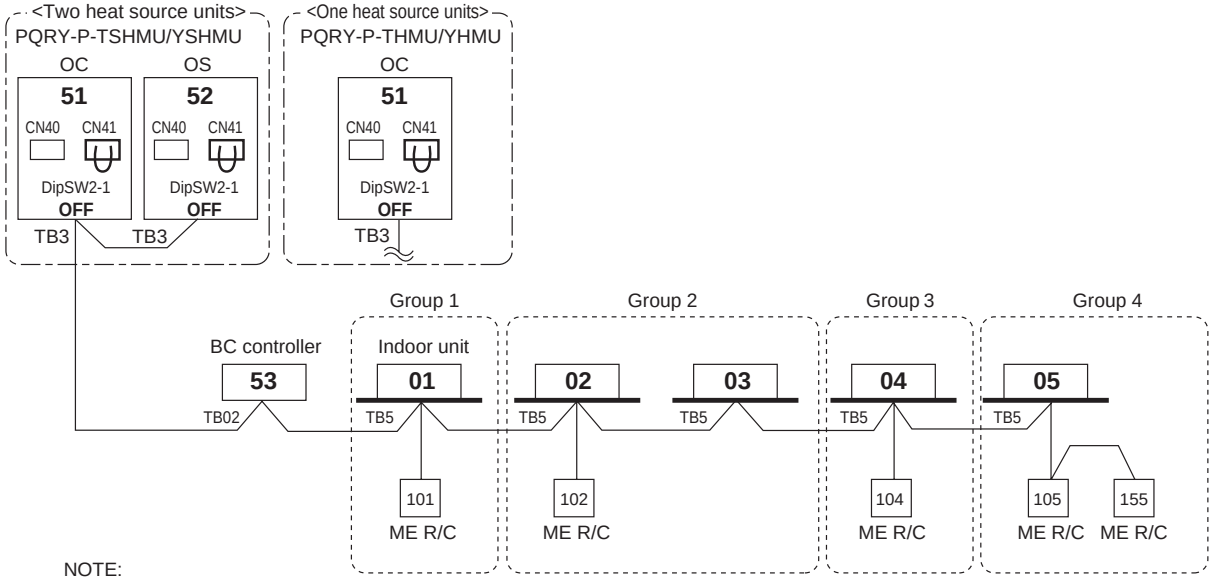
*2 System controller should connect to TB7 at the Heat source unit and use power supply unit together in Multi-Refrigerant-System. For AG-150A, 24VDC should be used with the PAC-SC51KUA.

*3 When multiple system controllers are connected in the system, set the controller with more functions than others as a "main" controller and others as "sub".
Make the setting to only one of the system controllers for "prohibition of operation from local remote controller".

NOTE:

1. Heat source units OC and OS in one refrigerant circuit system are automatically detected. OC and OS are ranked in descending order of capacity. If units are the same capacity, they are ranked in ascending order of their address.
2. Address should be set to Indoor units, LOSSNAY and system controller.
3. M-NET power is supplied by the Heat source unit at TB3, while Indoor unit and ME remote controller consume the M-NET power for transmission use. The power balance is needed to consider for long M-NET wiring. Details refer to **2-3 "System configuration restrictions".**
4. Indoor units should be set with a branch number.
5. Assign an address to each of the sub BC controllers which equals the sum of the smallest address of the indoor units that are connected to each sub BC controller and 50.

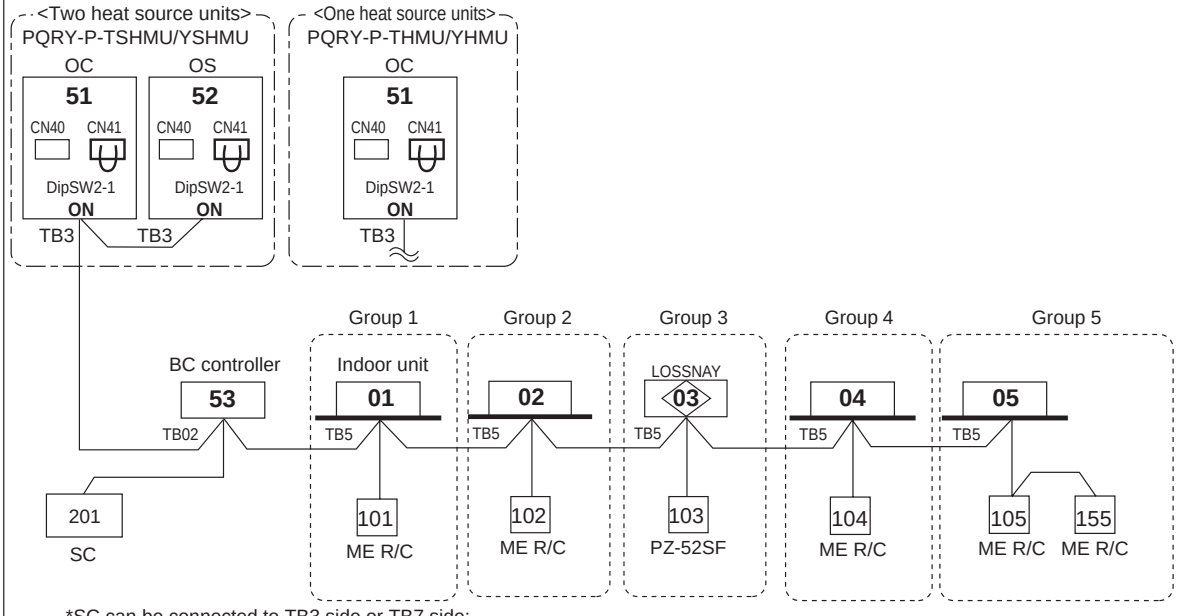
2-4-3-4. ME remote controller, Single-refrigerant-system, No system controller



NOTE:

1. Heat source units OC and OS in one refrigerant circuit system are automatically detected.
   OC and OS are ranked in descending order of capacity. If units are the same capacity, they are ranked in ascending order of their address.
2. Address should be set to Indoor units, system controller and ME remote controllers.
3. M-NET power is supplied by the Heat source unit at TB3, while Indoor unit and ME RC consume the M-NET power for transmission use. The power balance is needed to consider for long M-NET wiring. Details refer to **2-3 "System configuration restrictions".**
4. Indoor units should be set with a branch number.

2-4-3-5. ME remote controller, Single-refrigerant-system, System controller, LOSSNAY

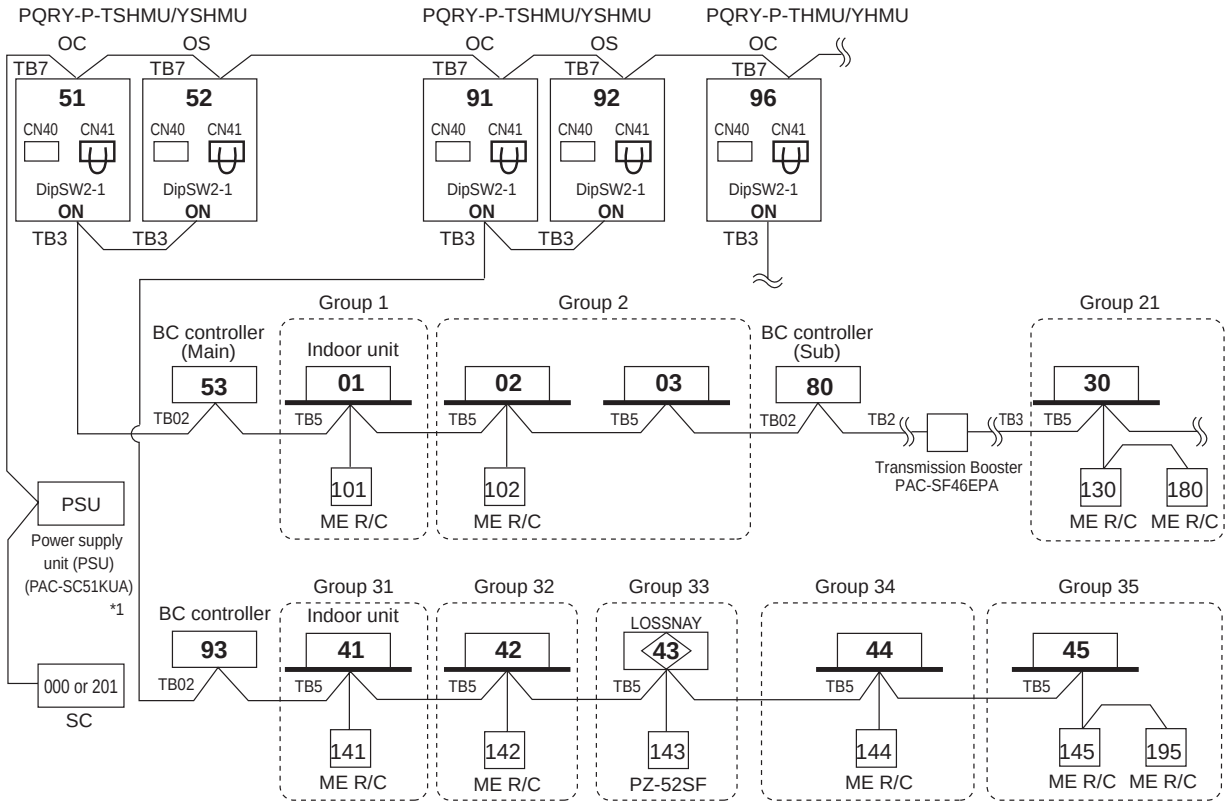


*SC can be connected to TB3 side or TB7 side;
Should SC connected to TB7 side, change Jumper from CN41 to CN40 at the Heat source unit module so as to supply power to the SC.

NOTE:

1. Heat source units OC and OS in one refrigerant circuit system are automatically detected.
   OC and OS are ranked in descending order of capacity. If units are the same capacity, they are ranked in ascending order of their address.
2. Address should be set to Indoor units, LOSSNAY central controller, ME remote controllers.
3. For a system having more than 32 indoor unit (P06-P54), confirm the need of Booster at **2-3 "System configuration restrictions".**
4. Indoor units should be set with a branch number.

2-4-3-6. ME remote controller, Multi-refrigerant-system, System Controller at TB 7side, LOSSNAY, Booster for long M-NET wiring



*1 System controller should connect to TB7 at the Heat source unit and use power supply unit together in Multi-Refrigerant-System. For AG-150A, 24VDC should be used with the PAC-SC51KUA.

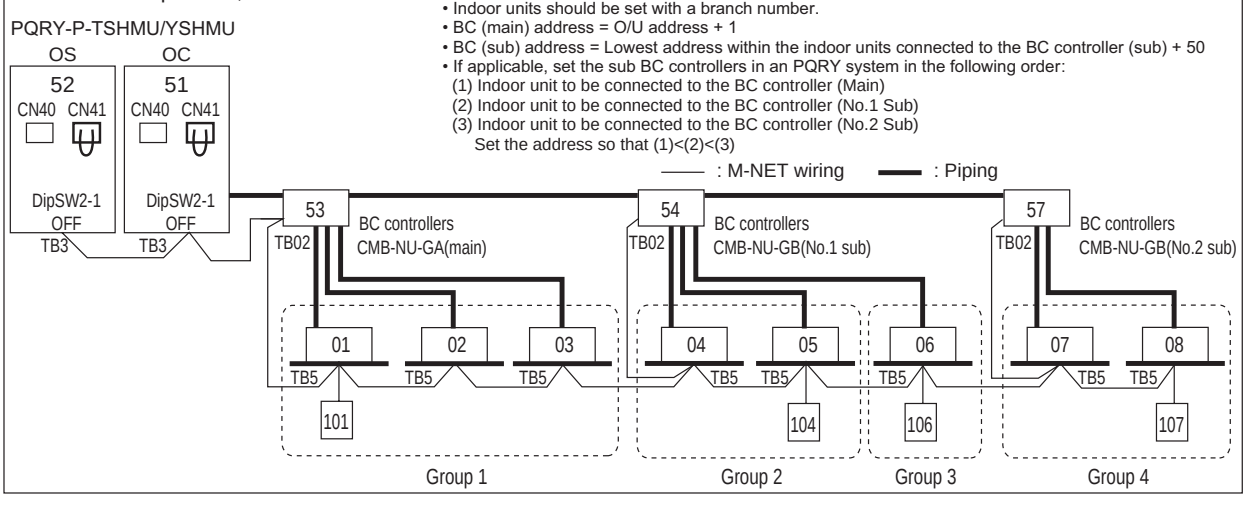
NOTE:

1. Heat source units OC and OS in one refrigerant circuit system are automatically detected. OC and OS are ranked in descending order of capacity. If units are the same capacity, they are ranked in ascending order of their address.
2. M-NET power is supplied by the Heat source unit at TB3, while Indoor unit and ME RC consume the M-NET power for transmission use. The power balance is needed to consider for long M-NET wiring. Details refer to **2-3 "System configuration restrictions".**
3. Indoor units should be set with a branch number.
4. Assign an address to each of the sub BC controllers which equals the sum of the smallest address of the indoor units that are connected to each sub BC controller and 50.
   When the address assigned to sub BC controller overlaps those of any other units including heat source units (OC/OS) or main BC controller, sub BC controller will be given priority to have the address.

2-4-3-7. Example : BC, BC sub

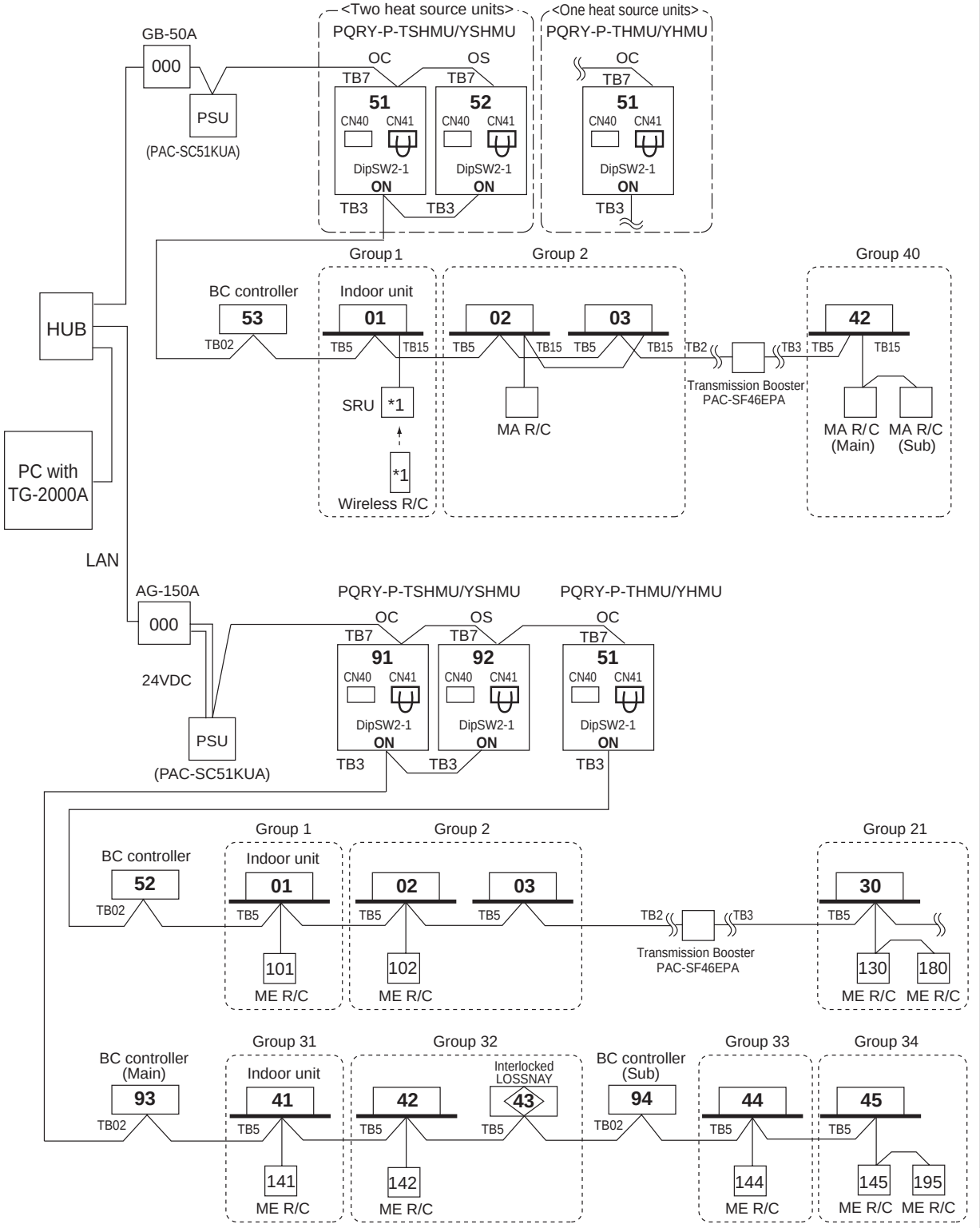
NOTE

- Indoor units should be set with a branch number.
- BC (main) address = O/U address + 1
- BC (sub) address = Lowest address within the indoor units connected to the BC controller (sub) + 50
- If applicable, set the sub BC controllers in an PQRY system in the following order:
  (1) Indoor unit to be connected to the BC controller (Main)
  (2) Indoor unit to be connected to the BC controller (No.1 Sub)
  (3) Indoor unit to be connected to the BC controller (No.2 Sub)
  Set the address so that (1)<(2)<(3)



2-4-3-8. TG-2000A+AG-150A/GB-50A

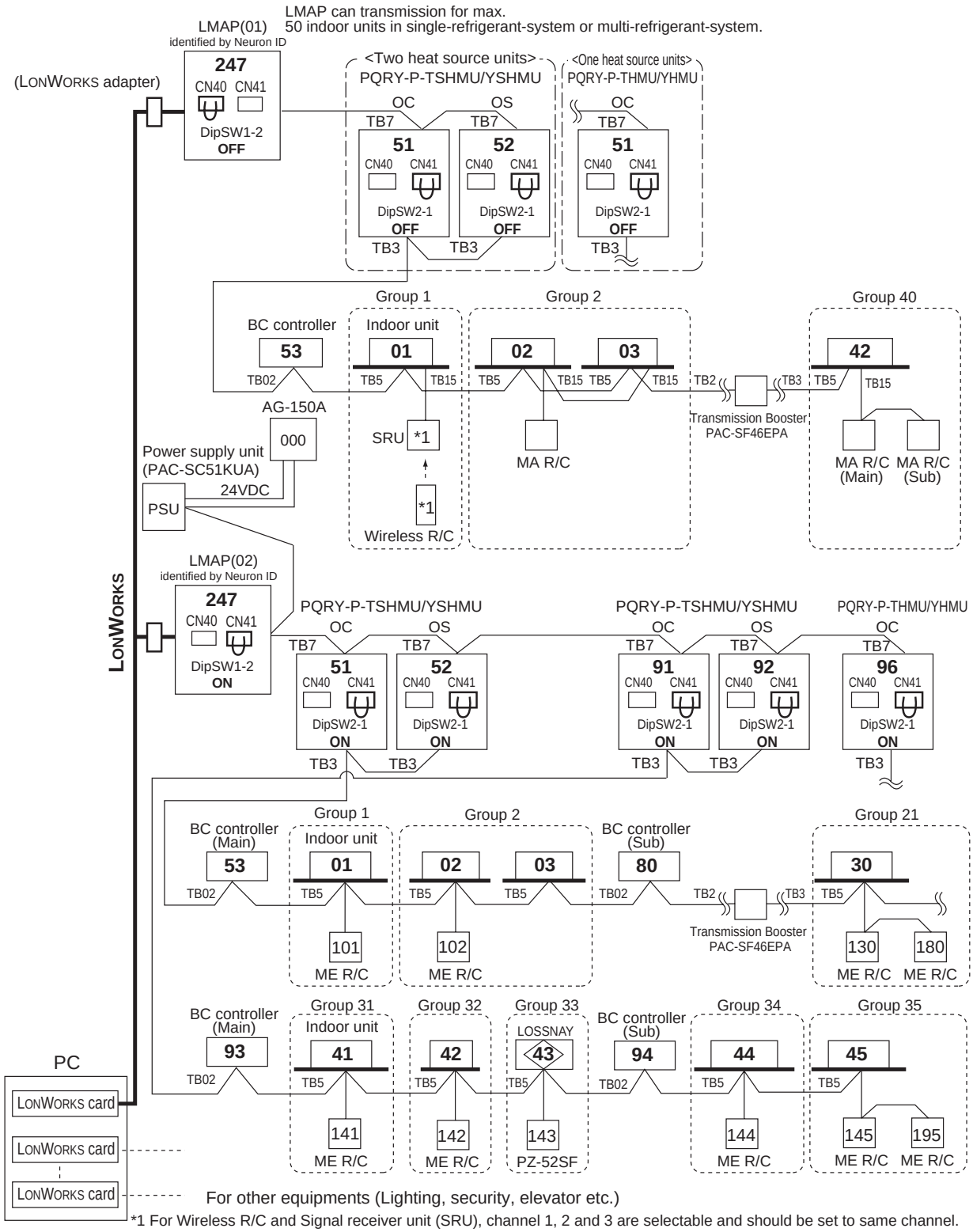
AG-150A/GB-50A can control max. 50 indoor units;
TG-2000A can control max. 40 pieces of AG-150A*2 or GB-50A;
TG-2000A can control max. 2000 indoor units.



*1 For Wireless R/C and Signal receiver unit (SRU), channel 1, 2 and 3 are selectable and should be set to same channel.
*2 Only AG-150As that are not connected to expansion controllers.

2-4-3-9. LMAP

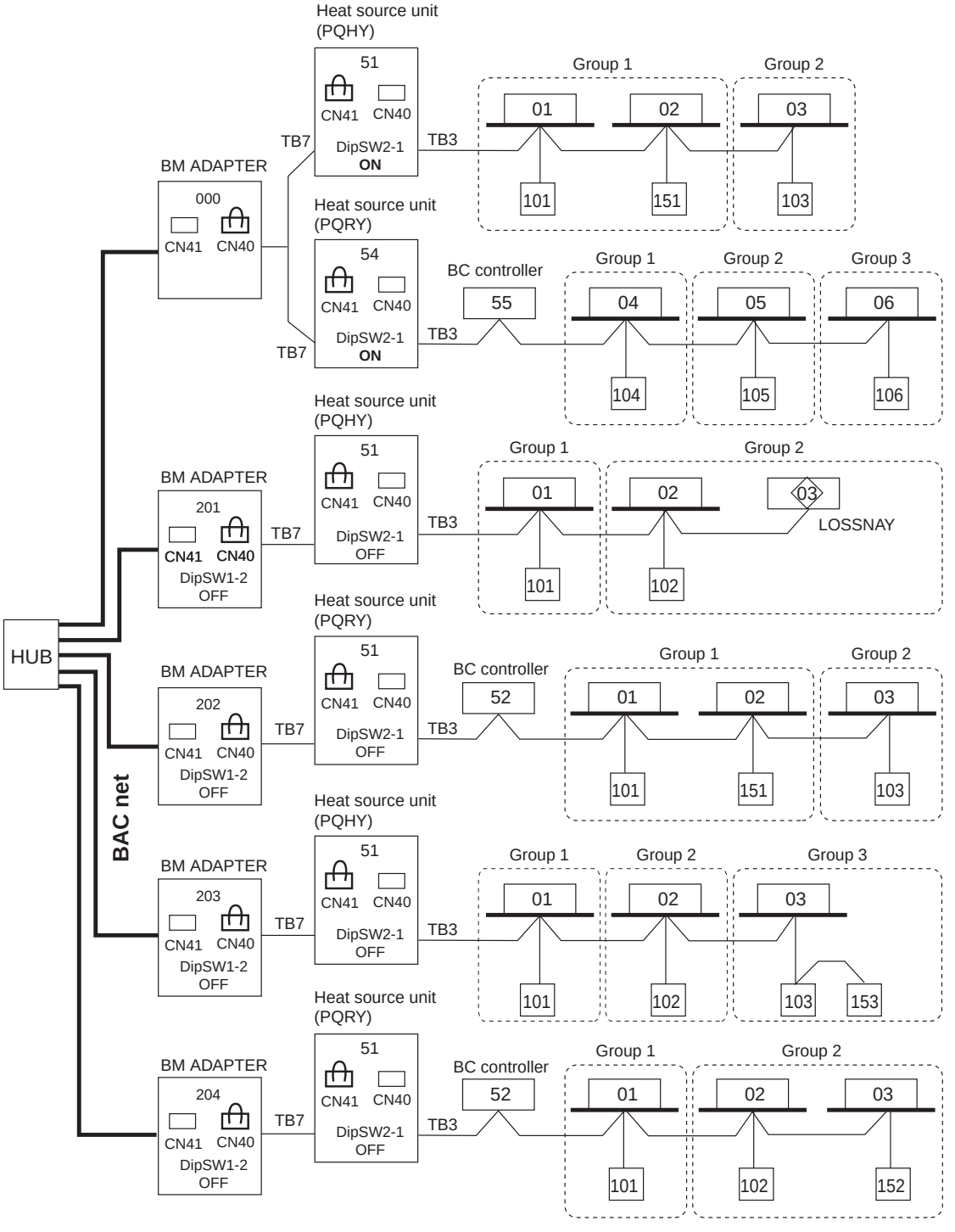
LMAP can transmission for max. 50 indoor units;
If system controller (SC) is used, DipSW1-2 at LMAP and DipSW2-1 at Heat source unit should set to "ON".
Change Jumper from CN41 to CN40 to activate power supply to LMAP itself for those LMAP connected without system controller (SC).



*1 For Wireless R/C and Signal receiver unit (SRU), channel 1, 2 and 3 are selectable and should be set to same channel.

2-4-3-10. BM ADAPTER

BM ADAPTER can transmission for max. 50 indoor units;
Change Jumper from CN41 to CN40 to activate power supply to BM ADAPTER itself for those BM ADAPTER connected without the power supply unit.



3-1. R410 Piping Material

Refrigerant pipe for CITY MULTI shall be made of phosphorus deoxidized copper, and has two types.
A. Type-O : Soft copper pipe (annealed copper pipe), can be easily bent with human's hand.
B. Type-1/2H pipe : Hard copper pipe (Straight pipe), being stronger than Type-O pipe of the same radical thickness.

The maximum operation pressure of R410A air conditioner is 4.30 MPa [623psi]. The refrigerant piping should ensure the safety under the maximum operation pressure. MITSUBISHI ELECTRIC recommends pipe size as Table 3-1, or You shall follow the local industrial standard. Pipes of radical thickness 0.7mm or less shall not be used.

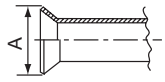
Table 3-1. Copper pipe size and radial thickness for R410A CITY MULTI.

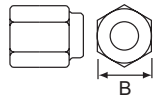
Size (mm)	Size (inch)	Radial thickness (mm)	Radial thickness (mil)	Pipe type
ø6.35	ø1/4"	0.8	[32]	Type-O
ø9.52	ø3/8"	0.8	[32]	Type-O
ø12.7	ø1/2"	0.8	[32]	Type-O
ø15.88	ø5/8"	1.0	[40]	Type-O
ø19.05	ø3/4"	1.2	[48]	Type-O
ø19.05	ø3/4"	1.0	[40]	Type-1/2H or H
ø22.2	ø7/8"	1.0	[40]	Type-1/2H or H
ø25.4	ø1"	1.0	[40]	Type-1/2H or H
ø28.58	ø1-1/8"	1.0	[40]	Type-1/2H or H
ø31.75	ø1-1/4"	1.1	[44]	Type-1/2H or H
ø34.93	ø1-3/8"	1.2	[48]	Type-1/2H or H
ø41.28	ø1-5/8"	1.4	[56]	Type-1/2H or H

* For pipe sized ø19.05 (3/4") for R410A air conditioner, choice of pipe type is up to you.
* The figures in the radial thickness column are based on the Japanese standards and provided only as a reference. Use pipes that meet the local standards.

Flare

Due to the relative higher operation pressure of R410A compared to R22, the flare connection should follow dimensions mentioned below so as to achieve enough the air-tightness.

Flare pipe	Pipe size	A (For R410A) (mm[in.])
	ø6.35 [1/4"]	9.1
	ø9.52 [3/8"]	13.2
	ø12.70 [1/2"]	16.6
	ø15.88 [5/8"]	19.7
	ø19.05 [3/4"]	24.0

Flare nut	Pipe size	B (For R410A) (mm[in.])
	ø6.35 [1/4"]	17.0
	ø9.52 [3/8"]	22.0
	ø12.70 [1/2"]	26.0
	ø15.88 [5/8"]	29.0
	ø19.05 [3/4"]	36.0

3-2. Piping Design

3-2-1. IF 16 ports or less are in use, I.e., if only one BC controller is in use with no sub BC controller.

Note1. PQRY systems do not require headers.
Note2. Indoor units sized P72-P96 should be connected to a BC controller using the Y-shaped CMY-R160-J joint adapter. These indoor units cannot use the same BC controller ports as other units. (They must use their own individual BC controller port.)
Note3. As bends cause pressure loss on transportation of refrigerant, the fewer bends in the system, the better it is. Piping length needs to factor in the actual length and equivalent length in which the bends are counted.
Note4. Indoor units connected to the BC controller sharing one port cannot operate separately in heating and cooling modes simultaneously; i.e., they must function in either heating or cooling in tandem.
Note5. Indoor unit capacities are included in the model name. For example, PEFY-P24NMSU-E has a capacity of 24,000 BTUs.
Note6. Total "downstream indoor capacity" is the total of all the indoor units connected downstream. For example, PEFY-P24NMSU-E + PEFY-P12NMSU-E: Total Indoor Unit Capacity = P24 + P12 = P36.

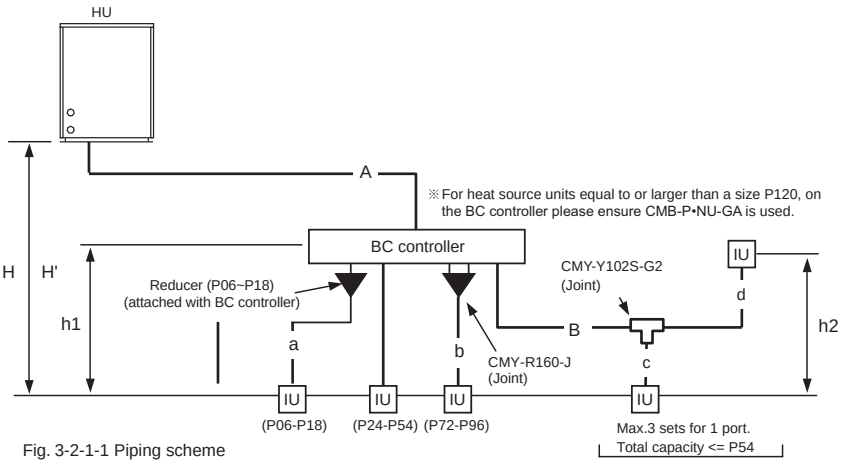


Fig. 3-2-1-1 Piping scheme

Table 3-2-1-1. Piping length limitation **(m [ft.])**

Item	Piping in the figure	Max. length	Max. equivalent length
Total piping length	A+B+a+b+c+d	*1	-
Farthest IU from HU	A+B+d	165 [541']	190 [623']
Distance between HU and BC	A	110 [360'] *1	110 [360'] *1
Farthest IU from BC controller	B+d	40 [131'] *2	40 [131'] *2
Height between HU and IU (HU above IU)	H	50 [164'] *4	-
Height between HU and IU (HU under IU)	H'	40 [131'] *5	-
Height between IU and BC	h1	15 [49'] (10 [32']) *3	-
Height between IU and IU	h2	15 [49'] (10 [32']) *3	-

Table3-2-1-2. Bends equivalent length "M"

Heat source Model	M (m/bends [ft./bends])
P72THMU,YHMU	0.35 [1.15']
P96THMU,YHMU	0.42 [1.38']
P120THMU,YHMU	0.47 [1.54']

HU : Heat source Unit ; IU : Indoor Unit ; BC : BC controller
*1. Please refer to Fig.3-2-4
*2. Farthest Indoor from BC controller "B+d" can exceed 40m(131ft.) till 60m(196ft.) if no Indoor sized P72, P96 connected. Details refer to Fig.3-2-1-2
*3. Distance of Indoor sized P72, P96 from BC must be less than 10m(32ft.), if any.

Fig. 3-2-1-2 Piping length and height between IU and BC controller

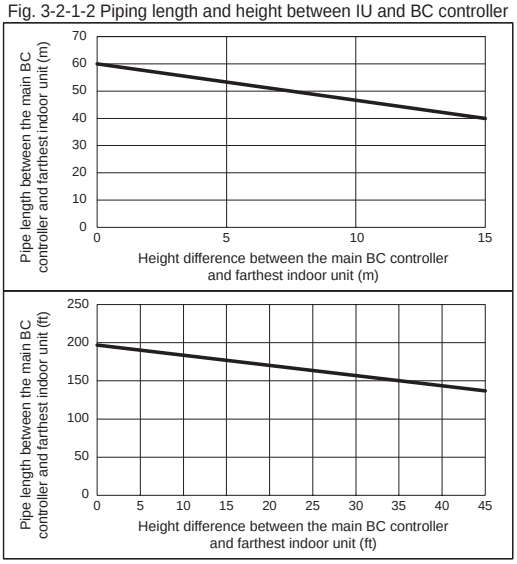


Table3-2-1-3. Piping "A"size selection rule **(mm [in.])**

Heat source Model	Pipe(High pressure)	Pipe(Low pressure)
P72THMU,YHMU	ø15.88 [5/8"]	ø19.05 [3/4"]
P96THMU,YHMU	ø19.05 [3/4"]	ø22.20 [7/8"]
P120THMU,YHMU	ø19.05 [3/4"]	ø28.58 [1-1/8"]

Table3-2-1-4. Piping "B" size seleciton rule **(mm [in.])**

Total down-stream Indoor capacity	Pipe(Liquid)	Pipe(Gas)
P54 or less	ø9.52 [3/8"]	ø15.88 [5/8"]

Table3-2-1-5. Piping "a", "b", "c", "d" size selection rule **(mm [in.])**

Indoor Unit size	Pipe(Liquid)	Pipe(Gas)
P06 to P18	ø6.35 [1/4"]	ø12.70 [1/2"]
P24 to P54	ø9.52 [3/8"]	ø15.88 [5/8"]
P72	ø9.52 [3/8"]	ø19.05 [3/4"]
P96	ø9.52 [3/8"]	ø22.20 [7/8"]

3-2-2. IF more than 16 ports are in use, or if there is more than one BC controller in use for one heat source unit

Note1. PQRY systems do not require headers.
Note2. Indoor units sized P72-P96 should be connected to a BC controller using the Y-shaped CMY-R160-J joint adapter. These indoor units cannot use the same BC controller ports as other units. (They must use their own individual BC controller port.)
Note3. As bends cause pressure loss on transportation of refrigerant, the fewer bends in the system, the better it is. Piping length needs to factor in the actual length and equivalent length in which the bends are counted.
Note4. Indoor units connected to the BC controller sharing one port cannot operate separately in heating and cooling modes simultaneously; i.e., they must function in either heating or cooling in tandem.
Note5. For sub BC controller CMB-P-NU-GB, the total connectable indoor unit capacity can be 126,000 BTUs or less.
If two sub BC controllers are used, the total indoor unit capacity connected to BOTH sub BC controllers also cannot exceed 126,000 BTUs.
For sub BC controller CMB-P1016NU-HB the total connectable indoor unit capacity can be 126,000 BTUs or less. However, if two sub controllers are used, the total indoor unit capacity connected to BOTH sub controllers must NOT exceed 168,000BTUs.
Note6. Indoor unit capacities are included in the model name. For example, PEFY-P24NMSU-E has a capacity of 24,000 BTUs.
Note7. Total "downstream indoor capacity" is the total of all the indoor units connected downstream.
For example, PEFY-P24NMSU-E + PEFY-P12NMSU-E: Total Indoor Unit Capacity = P24 + P12 = P36.

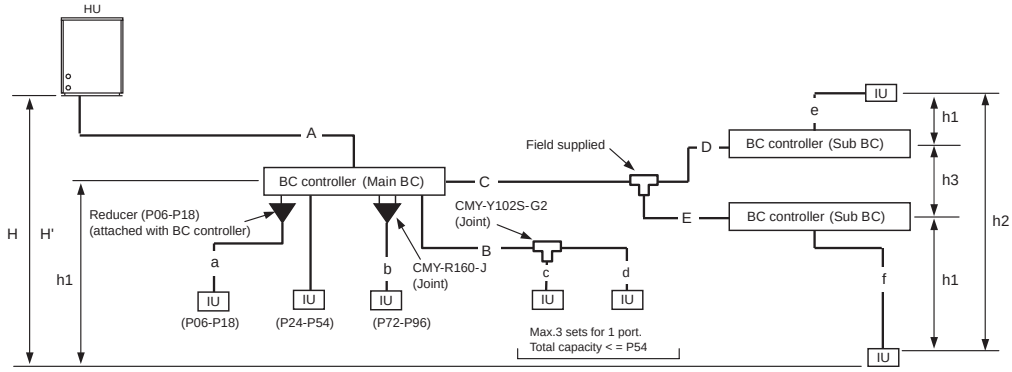


Fig. 3-2-2-1 Piping scheme

HU : Heat source unit, IU : Indoor unit

Table 3-2-2-1. Piping length limitation (m [ft.])

Item	Piping in the figure	Max. length	Max. equivalent length
Total piping length	A+B+C+D+E+a+b+c+d+e+f	*1	-
Farthest IU from HU	A+C+E+f	165 [541']	190 [623']
Distance between HU and BC	A	110 [360'] *1	110 [360'] *1
Farthest IU from BC controller	B+d or C+D+e or C+E+f	40 [131'] *2	40 [131'] *2
Height between HU and IU (HU above IU)	H	50 [164'] *5	-
Height between HU and IU (HU under IU)	H'	40 [131'] *6	-
Height between IU and BC	h1	15 [49'] (10 [32']) *3	-
Height between IU and IU	h2	15 [49'] (10 [32']) *3	-
Height between BC(Main or Sub) and BC(Sub)	h3	15 [49'] (10 [32']) *4	-

Table3-2-2-2. Bent equivalent length "M"

Heat source Model	M (m/bends [ft./bends])
P72THMU,YHMU	0.35 [1.15']
P96THMU,YHMU	0.42 [1.38']
P120THMU,YHMU	0.47 [1.54']

HU : Heat source Unit ; IU : Indoor Unit ; BC : BC controlle

*1. Please refer to Fig.3-2-4
*2. Farthest Indoor from BC controller "B+d or C+D+e or C+E+f " can exceed 40m(131ft.) till 60m(196ft.) if no Indoor sized P72, P96 connected. Details refer to Fig.3-2-2-2
*3. Distance of Indoor sized P72, P96 from BC must be less than 10m(32ft.), if any.
*4. When using 2 Sub BC controllers, max. height "h3" should be considered.

Fig. 3-2-2-2 Piping length and height between IU and BC controller

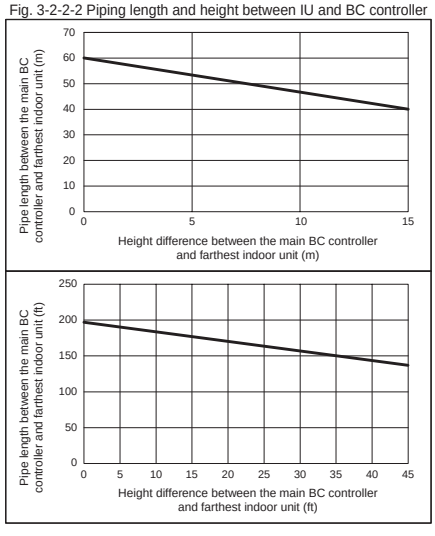


Table3-2-2-3. Piping "A"size selection rule (mm [in.])

Heat source Model	Pipe(High pressure)	Pipe(Low pressure)
P72THMU,YHMU	ø15.88 [5/8"]	ø19.05 [3/4"]
P96THMU,YHMU	ø19.05 [3/4"]	ø22.20 [7/8"]
P120THMU,YHMU	ø19.05 [3/4"]	ø28.58 [1-1/8"]

Table3-2-2-4. Piping "B" size selection rule (mm [in.])

Total down-stream Indoor capacity	Pipe(Liquid)	Pipe(Gas)
P54 or less	ø9.52 [3/8"]	ø15.88 [5/8"]

Table3-2-2-5. Piping "C", "D", "E" size selection rule (mm [in.])

Total down-stream Indoor capacity	Pipe(Liquid)	Pipe(HP Gas)	Pipe(LP Gas)
P72 or less	ø9.52 [3/8"]	ø15.88 [5/8"]	ø19.05 [3/4"]
P73 to P108	ø9.52 [3/8"]	ø19.05 [3/4"]	ø22.20 [7/8"]
P109 to P126	ø12.70 [1/2"]	ø19.05 [3/4"]	ø28.58 [1-1/8"]
P127 to P144	ø12.70 [1/2"]	ø22.20 [7/8"]	ø28.58 [1-1/8"]
P145 to P168	ø15.88 [5/8"]	ø22.20 [7/8"]	ø28.58 [1-1/8"]

HP : High pressure, LP:Low pressure

Table3-2-2-6. Piping "a", "b", "c", "d" saize selection rule (mm [in.])

Indoor Unit size	Pipe(Liquid)	Pipe(Gas)
P06 to P18	ø6.35 [1/4"]	ø12.70 [1/2"]
P24 to P54	ø9.52 [3/8"]	ø15.88 [5/8"]
P72	ø9.52 [3/8"]	ø19.05 [3/4"]
P96	ø9.52 [3/8"]	ø22.20 [7/8"]

3-2-3. IF more than 16 ports are in use, or if there is more than one BC controller in use for two heat source units

Note1. PQRY systems do not require headers.
Note2. Indoor units sized P72-P96 should be connected to a BC controller using the Y-shaped CMY-R160-J joint adapter. These indoor units cannot use the same BC controller ports as other units. (They must use their own individual BC controller port.)
Note3. As bends cause pressure loss on transportation of refrigerant, the fewer bends in the system, the better it is. Piping length needs to factor in the actual length and equivalent length in which the bends are counted.
Note4. Indoor units connected to the BC controller sharing one port cannot operate separately in heating and cooling modes simultaneously; i.e., they must function in either heating or cooling in tandem.
Note5. For sub BC controller CMB-P-NU-GB, the total connectable indoor unit capacity can be 126,000 BTUs or less. If two sub BC controllers are used, the total indoor unit capacity connected to BOTH sub BC controllers also cannot exceed 126,000 BTUs.
For sub BC controller CMB-P1016NU-HB the total connectable indoor unit capacity can be 126,000 BTUs or less. However, if two sub controllers are used, the total indoor unit capacity connected to BOTH sub controllers must NOT exceed 168,000BTUs.
Note6. Indoor unit capacities are included in the model name. For example, PEFY-P24NMSU-E has a capacity of 24,000 BTUs.
Note7. Total "downstream indoor capacity" is the total of all the indoor units connected downstream.
For example, PEFY-P24NMSU-E + PEFY-P12NMSU-E: Total Indoor Unit Capacity = P24 + P12 = P36.

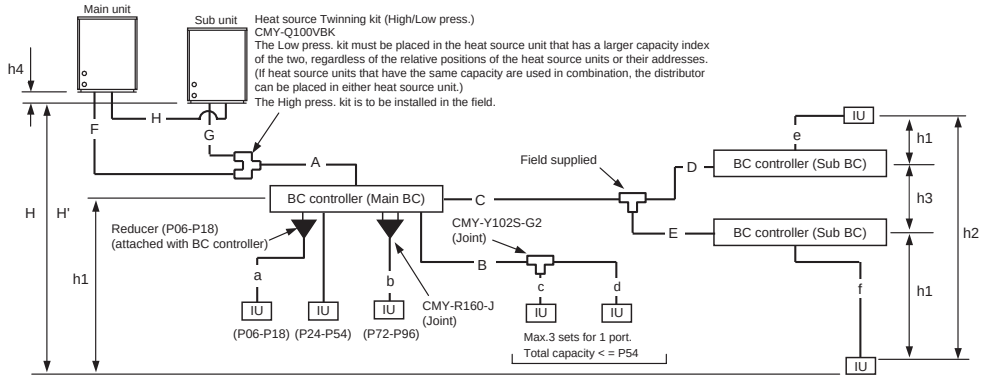


Fig. 3-2-3-1 Piping scheme

IU : Indoor unit

Table3-2-3-1. Piping length limitation (m [ft.])

Item	Piping in the figure	Max. length	Max. equivalent length
Total piping length	F+G+H+A+B+C+D+E+a+b+c+d+e+f	*1	-
Farthest IU from HU	F(G)+A+C+E+f	165 [541']	190 [623']
Distance between HU and BC	F(G)+A	110 [360'] *1	110 [360'] *1
Farthest IU from BC controller	B+d or C+D+e or C+E+f	40 [131'] *2	40 [131'] *2
Height between HU and IU (HU above IU)	H	50 [164'] *5	-
Height between HU and IU (HU under IU)	H'	40 [131'] *6	-
Height between IU and BC	h1	15 [49'] (10 [32']) *3	-
Height between IU and IU	h2	15 [49'] (10 [32']) *3	-
Height between BC(Main or Sub) and BC(Sub)	h3	15 [49'] (10 [32']) *4	-
Distance between Main unit and Sub unit	F+G or H	5 [16']	-
Height between Main unit and Sub unit	h4	0.1 [0.3']	-

Table3-2-3-2. Bent equivalent length "M"

Heat source Model	M (m/bends [ft./bends])
P144TSHMU,YSHMU	0.50 [1.64']
P168TSHMU,YSHMU	0.50 [1.64']
P192TSHMU,YSHMU	0.50 [1.64']
P216TSHMU,YSHMU	0.50 [1.64']
P240TSHMU,YSHMU	0.50 [1.64']

HU : Heat source Unit ; IU : Indoor Unit ; BC : BC controller
*1. Please refer to Fig.3-2-4
*2. Farthest Indoor from BC controller "B+d or C+D+e or C+E+f " can exceed 40m(131ft.) till 60m(196ft.) if no Indoor sized P72, P96 connected. Details refer to Fig.3-2-3-2
*3. Distance of Indoor sized P72, P96 from BC must be less than 10m(32ft.), if any.
*4. When using 2 Sub BC controllers, max. height "h3" should be considered.

Fig. 3-2-3-2 Piping length and height between IU and BC controller

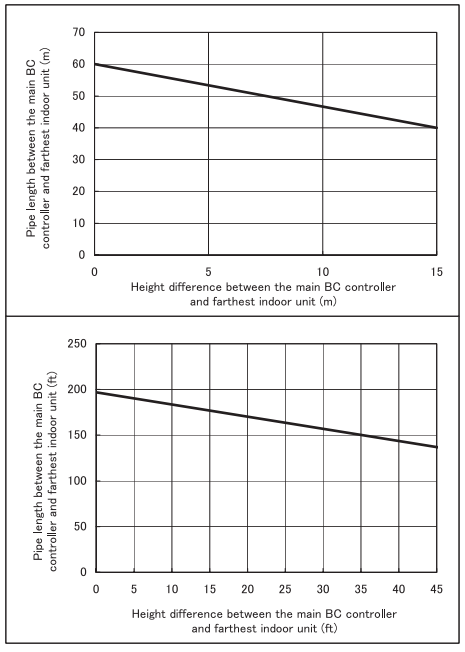


Table3-2-3-3. Piping "A"size selection rule (mm [in.])

Heat source Model	Pipe(High pressure)	Pipe(Low pressure)
P144TSHMU,YSHMU	ø22.20 [7/8"]	ø28.58 [1-1/8"]
P168TSHMU,YSHMU	ø22.20 [7/8"]	ø28.58 [1-1/8"]
P192TSHMU,YSHMU	ø22.20 [7/8"]	ø28.58 [1-1/8"]
P216TSHMU,YSHMU	ø28.58 [1-1/8"]	ø28.58 [1-1/8"]
P240TSHMU,YSHMU	ø28.58 [1-1/8"]	ø28.58 [1-1/8"]

Table3-2-3-4. Piping "B" size seleciton rule (mm [in.])

Total down-stream Indoor capacity	Pipe(Liquid)	Pipe(Gas)
P54 or less	ø9.52 [3/8"]	ø15.88 [5/8"]

Table3-2-3-5. Piping "C", "D", "E" size selection rule (mm [in.])

Total down-stream Indoor capacity	Pipe(Liquid)	Pipe(HP Gas)	Pipe(LP Gas)
P72 or less	ø9.52 [3/8"]	ø15.88 [5/8"]	ø19.05 [3/4"]
P73 to P108	ø9.52 [3/8"]	ø19.05 [3/4"]	ø22.20 [7/8"]
P109 to P126	ø12.70 [1/2"]	ø19.05 [3/4"]	ø28.58 [1-1/8"]
P127 to P144	ø12.70 [1/2"]	ø22.20 [7/8"]	ø28.58 [1-1/8"]
P145 to P168	ø15.88 [5/8"]	ø22.20 [7/8"]	ø28.58 [1-1/8"]

HP : High pressure, LP:Low pressure

Table3-2-3-6. Piping "F", "G", "H" size selection rule (mm [in.])

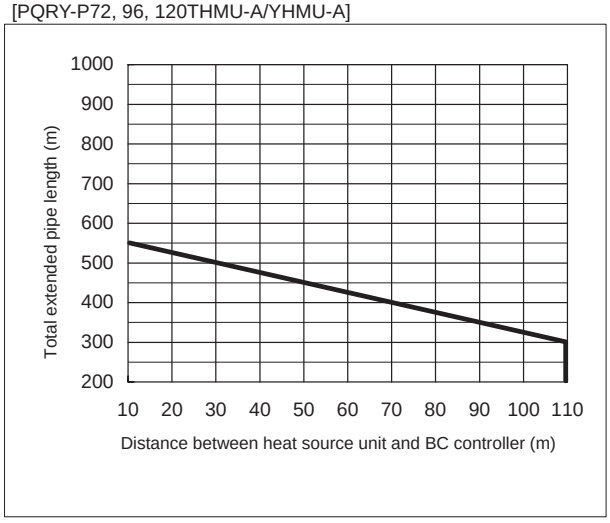
Heat source Model	Pipe(High pressure)	Pipe(Low pressure)
P72THMU,YHMU	ø15.88 [5/8"]	ø19.05 [3/4"]
P96THMU,YHMU	ø19.05 [3/4"]	ø22.20 [7/8"]
P120THMU,YHMU	ø19.05 [3/4"]	ø28.58 [1-1/8"]

Table3-2-3-7. Piping "a", "b", "c", "d"size selection rule (mm [in.])

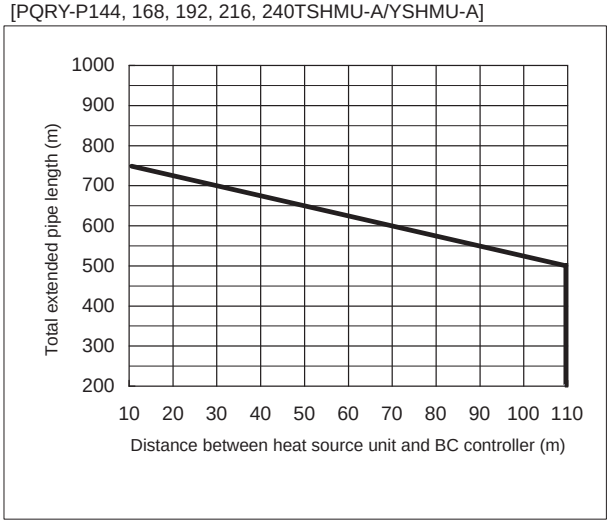
Indoor Unit size	Pipe(Liquid)	Pipe(Gas)
P06 to P18	ø6.35 [1/4"]	ø12.70 [1/2"]
P24 to P54	ø9.52 [3/8"]	ø15.88 [5/8"]
P72	ø9.52 [3/8"]	ø19.05 [3/4"]
P96	ø9.52 [3/8"]	ø22.20 [7/8"]

3-2-4. Total piping length restrictions (m)

[PQRY-P72, 96, 120THMU-A/YHMU-A]

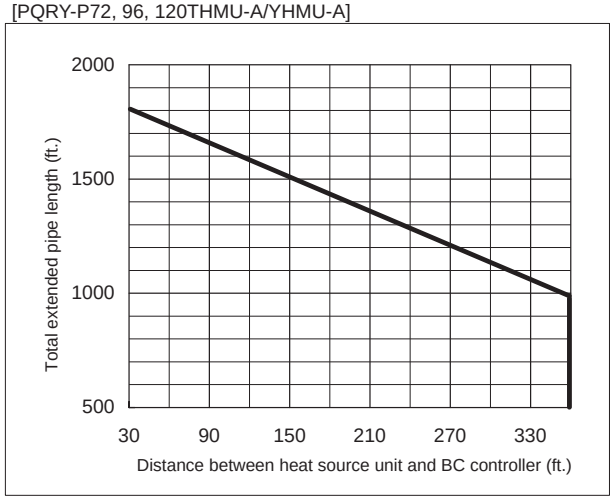


[PQRY-P144, 168, 192, 216, 240TSHMU-A/YSHMU-A]

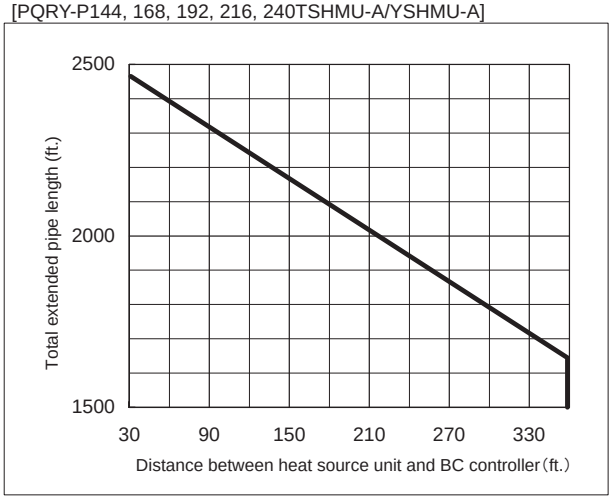


3-2-5. Total piping length restrictions (ft.)

[PQRY-P72, 96, 120THMU-A/YHMU-A]

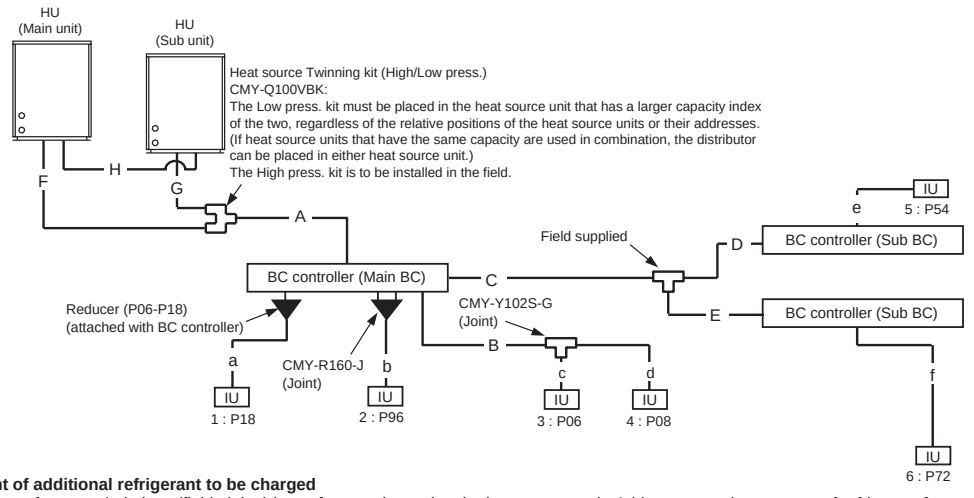


[PQRY-P144, 168, 192, 216, 240TSHMU-A/YSHMU-A]



3-3. Refrigerant Charging Calculation

Sample connection (with 3 BC controller and 6 indoor units)



■Amount of additional refrigerant to be charged

Refrigerant for extended pipes (field piping) is not factory-charged to the heat source unit. Add an appropriate amount of refrigerant for each pipes on site.
Record the size of each high pressure pipe and liquid pipe, and the amout of refrigerant that was charged on the heat source unit for future reference.

■Calculating the amount of additional refrigerant to be charged

The amount of refrigerant to be charged is calculated with the size of the on-site-installed high pressure pipes and liquid pipes, and their length.
Calculate the amount of refrigerant to be charged according to the formula below.
Round up the calculation result to the nearest 0.1kg[4oz]. (i.e., 16.08 kg = 16.1 kg)

<Amount of additional refrigerant to be charged>

■Calculating the amount of additional refrigerant to be charged

Additional refrigerant charge	=	High pressure pipe size Total length of ø 28.58mm[1-1/8 in]	+	High pressure pipe size Total length of ø 22.2mm[7/8 in]	+	High pressure pipe size Total length of ø 19.05mm[3/4 in]	+	High pressure pipe size Total length of ø 15.88mm[5/8 in]
(kg)[oz]		(m) × 0.36(kg/m) (ft) × 3.88(oz/ft)		(m) × 0.23(kg/m) (ft) × 2.48(oz/ft)		(m) × 0.16(kg/m) (ft) × 1.73(oz/ft)		(m) × 0.11(kg/m) (ft) × 1.19(oz/ft)

+	Liquid Piping size Total length of ø 15.88mm[5/8 in]	+	Liquid Piping size Total length of ø 12.7mm[1/2 in]	+	Liquid Piping size Total length of ø 9.52mm[3/8 in]	+	Liquid Piping size Total length of ø 6.35mm[1/4 in]
	(m) × 0.2(kg/m) (ft) × 2.16(oz/ft)		(m) × 0.12(kg/m) (ft) × 1.30(oz/ft)		(m) × 0.06(kg/m) (ft) × 0.65(oz/ft)		(m) ×0.024(kg/m) (ft) ×0.26(oz/ft)

+	BC controller (Standard / Main)
	3.0 kg[106oz]

+	BC controller (Sub) Total Units	Charged amount
	1	1.0 kg[36oz]
	2	2.0 kg[71oz]

+	Total Capacity of Connected Indoor Units	Charged amount
	Models ~ 27	2.0 kg [71 oz]
	Models 28 ~ 54	2.5 kg [89 oz]
	Models 55 ~ 126	3.0 kg [106 oz]
	Models 127 ~ 144	3.5 kg [124 oz]
	Models 145 ~ 180	4.5 kg [159 oz]
	Models 181 ~ 234	5.0 kg [177 oz]
	Models 235 ~ 273	6.0 kg [212 oz]
	Models 274 ~ 307	8.0 kg [283 oz]
	Models 308 ~ 342	9.0 kg [318 oz]
	Models 343 ~ 411	10.0 kg [353 oz]
	Models 412 ~	12.0 kg [424 oz]

■Amount of factory charged refrigerant

Heat source unit Model	Charged amount
P72	5.0 kg
P96	
P120	

■Sample calculation

			Indoor			
A :	ø28.58 [1-1/8"]	40m [131ft.]	1 : P18	a :	ø6.35 [1/4"]	5m [16ft.]
B :	ø9.52 [3/8"]	10m [32ft.]	2 : P96	b :	ø9.52 [3/8"]	3m [10ft.]
C :	ø12.70 [1/2"]	10m [32ft.]	3 : P06	c :	ø6.35 [1/4"]	2m [6ft.]
D :	ø9.52 [3/8"]	5m [16ft.]	4 : P08	d :	ø6.35 [1/4"]	3m [10ft.]
E :	ø9.52 [3/8"]	5m [16ft.]	5 : P54	e :	ø9.52 [3/8"]	3m [10ft.]
F :	ø22.20 [7/8"]	2m [6ft.]	6 : P72	f :	ø9.52 [3/8"]	10m [32ft.]
G :	ø22.20 [7/8"]	1m [4ft.]				

Total length for each pipe size :
ø28.58 A = 40m [131ft.]
ø22.20 F+G = 2+1 = 3m [10ft.]
ø12.70 C = 10m [32ft.]
ø9.52 B+D+E+b+e+f = 36m [116ft.]
ø6.35 a+c+d =10m [32ft.]

Therefore, additional refrigerant charge (kg) = 40×0.36 + 3×0.23 + 10×0.12 + 36×0.06 + 10×0.024 + 9.0 + 2.0 + 6.0
= 37.69kg
≒ 37.7kg

or

Therefore, additional refrigerant charge (oz) = 131×3.58+10×2.48+32×1.30+116×0.65+32×0.26+318+71+212
= 1220.1oz
≒ 1220oz

■Limitation of the amount of refrigerant to be charged

The above calculation result of the amount of refrigerant to be charged must become below the value in the table below.

Heat source unit model	P72	P96	P120	P144	P168	P192	P216	P240
Maximum amount of refrigerant *1 kg	26.3	32.8	33.8	45.5	47.0	58.2	67.2	70.9
(oz)	928	1157	1192	1605	1658	2053	2370	2501

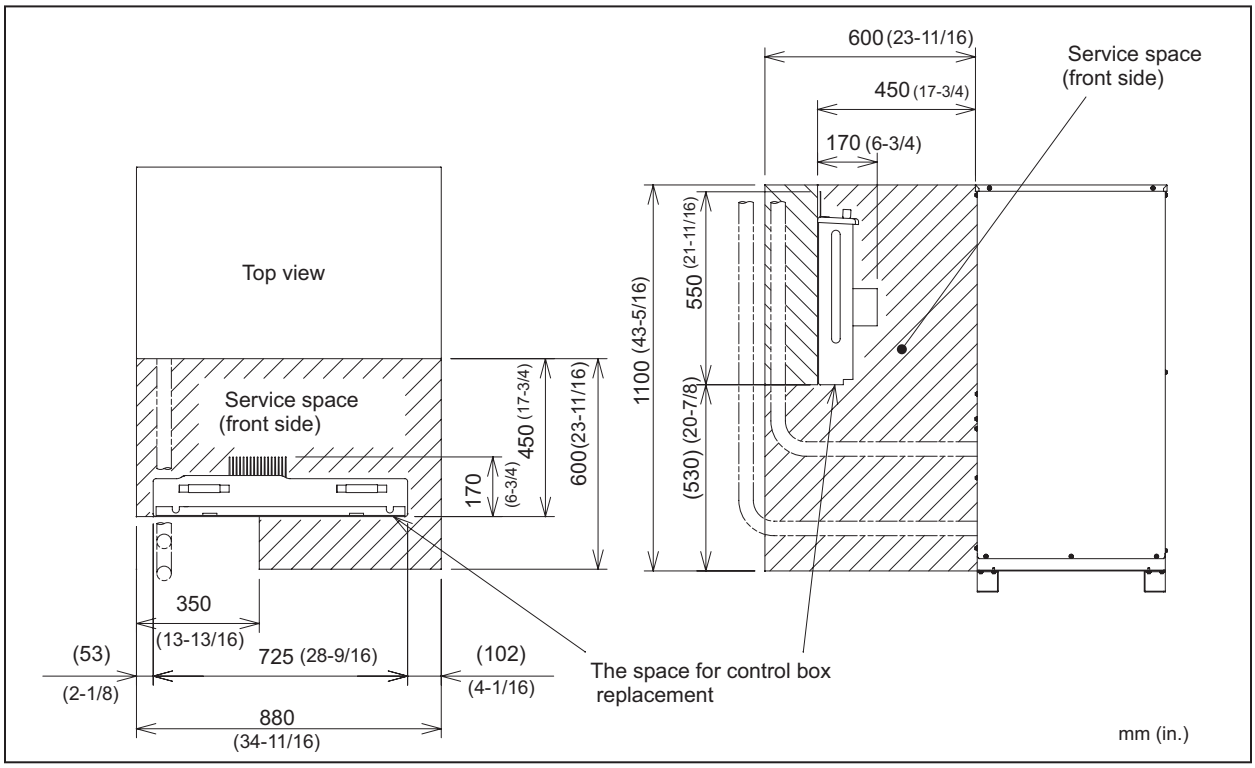
*1 Amount of additional refrigerant to be charged on site.

4-1. PQRY-P-T(S)HMU/Y(S)HMU's Installation

1. Install indoors; avoid exposing the unit to outside elements.
2. Do not install in an area where it could be subjected to direct heat.
3. Avoid installing the unit in a location where the operating sound could be an annoyance.
4. Install on a stable, load-bearing surface.
5. Ensure there is adequate drain flow from the unit when in heating mode;
6. See space requirements for installation and maintenance;
7. Do not install the unit in an environment that may have combustible gas, oil, steam, chemical gas like acidic solutions, sulfur gas, etc.
8. Make sure the declining gradient of the exhaust pipe is higher than 1/100.

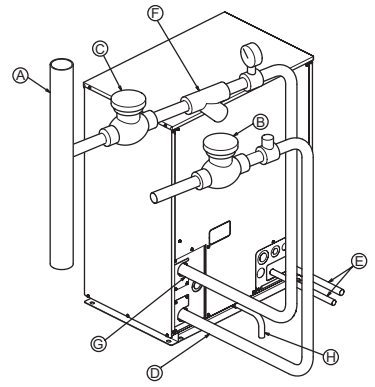
4-2. Installation Space

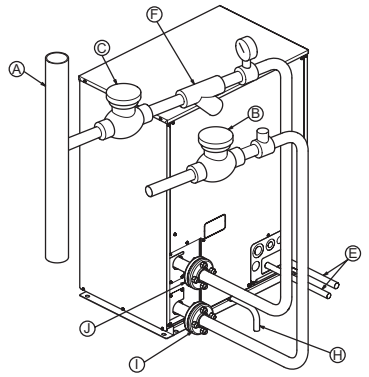
In case of a single unit installation, 23-11/16 in. (600mm) or more of clearance space in the front of the unit makes for easier access when servicing the unit.



4-3. Piping Direction

<Model : PQHY, PQRY-P-THMU-A/YHMU-A>





Ⓐ Main circulating water pipe
Ⓑ Shutoff valve
Ⓒ Shutoff valve
Ⓓ Water outlet (lower)
Ⓔ Refrigerant pipes
Ⓕ Y-type strainer
Ⓖ Water inlet (upper)
Ⓗ Drain pipe
Ⓘ Water outlet flange (lower)
Ⓙ Water intlet flange (upper)

1. Insulation installation

With City Multi WY/ WR2 Series piping, as long as the temperature range of the circulating water is kept to average temperatures year-round (29.4°C[85°F] in the summer, 21.1°C[70°F] in the winter), there is no need to insulate or otherwise protect indoor piping from exposure. You should use insulation in the following situations:

- Any heat source piping.
- Indoor piping in cold-weather regions where frozen pipes are a problem.
- When air coming from the outside causes condensation to form on piping.
- Any drainage piping.

2. Water processing and water quality control

To preserve water quality, use the closed type of cooling tower for WY/ WR2. When the circulating water quality is poor, the water heat exchanger can develop scales, leading to a reduction in heat-exchange power and possible corrosion of the heat exchanger. Please pay careful attention to water processing and water quality control when installing the water circulation system.

- Removal of foreign objects or impurities within the pipes.
  During installation, be careful that foreign objects, such as welding fragments, sealant particles, or rust, do not enter the pipes.
- Water Quality Processing

① Depending on the quality of the cold-temperature water used in the air conditioner, the copper piping of the heat exchanger may become corroded. We recommend regular water quality processing.
Cold water circulation systems using open heat storage tanks are particularly prone to corrosion.
When using an open-type heat storage tank, install a water-to-water heat exchanger, and use a closed-loop circuit on the air conditioner side. If a water supply tank is installed, keep contact with air to a minimum, and keep the level of dissolved oxygen in the water no higher than 1mg/ℓ.

② Water quality standard

Items		Lower mid-range temperature water system		Tendency	
		Recirculating water [20<T<60°C] [68<T<140°F]	Make-up water	Corrosive	Scale-forming
Standard items	pH (25°C)[77°F]	7.0 ~ 8.0	7.0 ~ 8.0	○	○
	Electric conductivity (mS/m) (25°C)[77°F] (μS/cm) (25°C)[77°F]	30 or less [300 or less]	30 or less [300 or less]	○	○
	Chloride ion (mg Cl^-/ ℓ)	50 or less	50 or less	○	
	Sulfate ion (mg SO_4^{2-}/ ℓ)	50 or less	50 or less	○	
	Acid consumption (pH4.8) (mg $CaCO_3$/ ℓ)	50 or less	50 or less		○
	Total hardness (mg $CaCO_3$/ ℓ)	70 or less	70 or less		○
	Calcium hardness (mg $CaCO_3$/ ℓ)	50 or less	50 or less		○
	Ionic silica (mg SiO_2/ ℓ)	30 or less	30 or less		○
Reference items	Iron (mg Fe/ ℓ)	1.0 or less	0.3 or less	○	○
	Copper (mg Cu/ ℓ)	1.0 or less	0.1 or less	○	
	Sulfide ion (mg S^{2-}/ ℓ)	not to be detected	not to be detected	○	
	Ammonium ion (mg NH_4^+/ ℓ)	0.3 or less	0.1 or less	○	
	Residual chlorine (mg Cl/ ℓ)	0.25 or less	0.3 or less	○	
	Free carbon dioxide (mg CO_2/ ℓ)	0.4 or less	4.0 or less	○	
	Ryzner stability index	–	–	○	○

Reference : Guideline of Water Quality for Refrigeration and Air Conditioning Equipment. (JRA GL02E-1994)

③ Please consult with a water quality control specialist about water quality control methods and water quality calculations before using anti-corrosive solutions for water quality management.

④ When replacing a previously installed air conditioning device (even when only the heat exchanger is being replaced), first conduct a water quality analysis and check for possible corrosion.
Corrosion can occur in cold-water systems even if there has been no prior signs of corrosion. If the water quality level has dropped, please adjust water quality sufficiently before replacing the unit.

The installer and/or air conditioning system specialist shall secure safety against refrigerant leakage according to local regulations or standards. The following standard may be applicable if no local regulation or standard is available.

5-1. Refrigerant Properties

R410A refrigerant is harmless and incombustible. The R410A is heavier than the indoor air in density. Leakage of the refrigerant in a room has possibility to lead to a hypoxia situation. Therefore, the Critial concentration specified below shall not be exceeded even if the leakage happens.

- **Critical concentration**

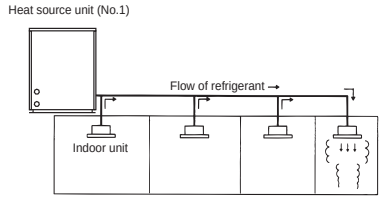
  Critical concentration hereby is the refrigerant concentration in which no human body would be hurt if immediate measures can be taken when refrigerant leakage happens.

Critical concentration of R410A: 0.30kg/m^3
(The weight of refrigeration gas per 1 m^3 air conditioning space.);
* The Critical concentration is subject to ISO5149, EN378-1.

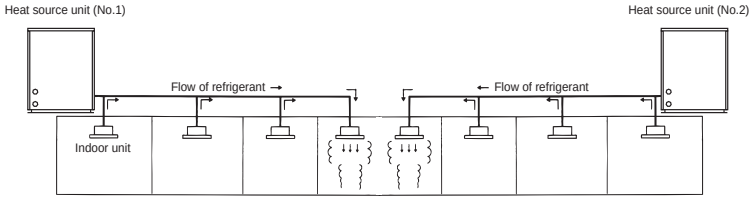
For the CITY MULTI system, the concentration of refrigerant leaked should not have a chance to exceed the Critical concentration in any situntion.

5-2. Confirm the Critical Concentration and Perform Countermeasures

The maximum refrigerant leakage concentration (Rmax) is defined as the result of the possible maximum refrigerant weight (Wmax) leaked into a room divided by its room capacity (V). It is referable to Fig. 5-1. The refrigerant of Heat source unit here includes its original charge and additional charge at the site.
The additional charge is calculated according to the refrigerant charging calculation of each kind of Heat source unit, and shall not be over charged at the site. Procedure 5-2-1~3 tells how to confirm maximum refrigerant leakage concentration (Rmax) and how to take countermeasures against a possible leakage.



Maximum refrigerant leakage concentration (Rmax)
Rmax=Wmax / V (kg/m^3)



Maximum refrigerant leakage concentration (Rmax)
Rmax=Wmax / V (kg/m ^{3}) W1: Refrigerant weight of Heat source unit No.1
where, Wmax=W1+W 2 W2: Refrigerant weight of Heat source unit No.2

Fig. 5-1 The maximum refrigerant leakage concentration

5-2-1.Find the room capacity (V),
If a room having total opening area more than 0.15% of the floor area at a low position with another room/space, the two rooms/space are considered as one. The total space shall be added up.
5-2-2.Find the possible maximum leakage (Wmax) in the room. If a room has Indoor unit(s) from more than 1 Heat source unit, add up the refrigerant of the Heat source units.
5-2-3.Divide (Wmax) by (V) to get the maximum refrigerant leakage concentration (Rmax).
5-2-4.Find if there is any room in which the maximum refrigerant leakage concentration (Rmax) is over 0.30kg/m^3.
If no, then the CITY MULTI is safe against refrigerant leakage.
If yes, following countermeasure is recommended to do at site.
Countermeasure 1: Let-out (making V bigger)
Design an opening of more than 0.15% of the floor area at a low position of the wall to let out the refrigerant whenever leaked.
e.g. make the upper and lower seams of door big enough.
Countermeasure 2: Smaller total charge (making Wmax smaller)
e.g. Avoid connecting more than 1 Heat source unit to one room.
e.g. Using smaller model size but more Heat source units.
e.g. Shorten the refrigerant piping as much as possible.
Countermeasure 3: Fresh air in from the ceiling (Ventilation)
As the density of the refrigerant is bigger than that of the air. Fresh air supply from the ceiling is better than air exhausting from the ceiling. Fresh air supply solution refers to Fig. 5-2~4.

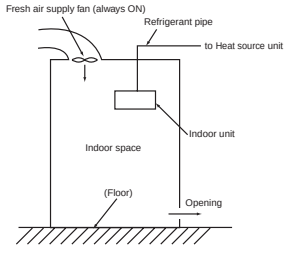


Fig.5-2. Fresh air supply always ON

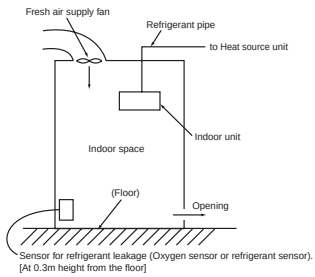


Fig.5-3. Fresh air supply upon sensor action

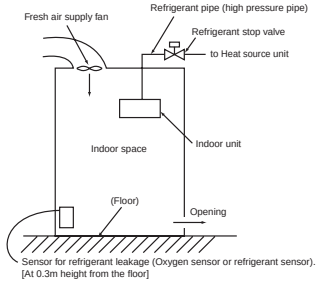


Fig.5-4. Fresh air supply and refrigerant shut-off upon sensor action

Note 1. Countermeasure 3 should be done in a proper way in which the fresh air supply shall be on whenever the leakage happens.
Note 2. In principle, MITSUBISHI ELECTRIC requires proper piping design, installation and air-tight testing after installation to avoid leakage happening.
In the area should earthquake happen, anti-vibration measures should be fully considered.
The piping should consider the extension due to the temperature variation.